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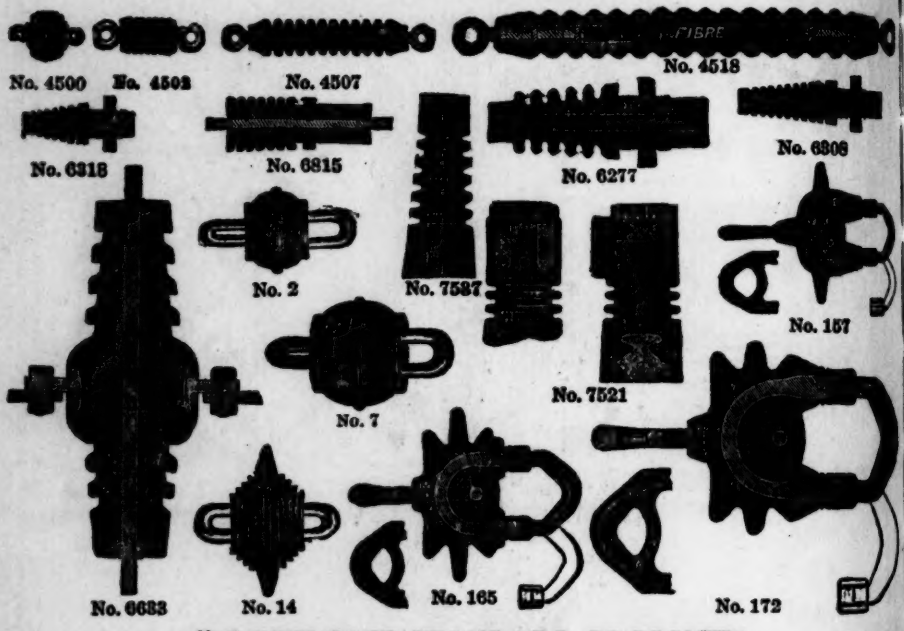

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THE RELATION OF PERSONNEL TO MATERIEL

By COMMANDER JOHN E. POND, U. S. Navy

FOREWORD

During the past ten years I have given much thought to the subject of this paper, and have long held the beliefs set forth in regard to the status of reserve ships and the organization of the reserve force.

I am fully aware that some of my ideas are rather radical, and would entail legislative changes if adopted; but I am fully convinced that I am right in my premises, and I feel that the time is now ripe to set them forth on paper.

I do this with the knowledge that many officers to whom I have presented these ideas have expressed agreement and some have requested me to write them down and submit them to the service for discussion; so if this paper proves worthy of discussion, whether of criticism or approval, I shall feel that I have accomplished my purpose and have rendered a service to the navy and to my country.

For the sake of brevity I have purposely avoided going into many of the essential details of administration and organization, contenting myself with setting forth the main features of my plan and trusting the reader to answer for himself, or bring forth in discussion, any collateral questions that may arise.

My desire is to obtain efficiency with economy, and to see the country get some adequate return for the enormous amount of money it now spends on maintaining the personnel of the navy and the Naval Reserve Force.

If the reorganization I have outlined for the Naval Reserve in the last pages of this paper could be effected, we would never again witness such a spectacle as is going on now—recruiting the navy up to 138,000 on January 21, about facing and inviting acceptance of discharges "without

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regard" to rate, length of service, vacancies in complement, etc., in order to reduce to 100,000; and then about facing again today; all in the short space of one short month.

I do not know yet how many men have been discharged; but I do know that it costs an average of about $100 per man to discharge them, and that those who were discharged from training stations were a total loss to the government, to say nothing of the effect on the morale of those who were expecting discharge when the order to stop was received.

Under the proposed organization of the reserve force, practically all of those *desirable* men would have transferred to the second reserve without further cost to the government.

JOHN E. POND.

U. S. Naval Training Station,
San Francisco, California,
March 2, 1921.

THE RELATION OF PERSONNEL TO MATÉRIEL

A PLEA FOR A POLICY

It is generally understood and conceded by those who give the subject any thought that armaments are the inevitable result of conflicting national policies.

It is also generally understood by legislators in Congress that some of our own national policies such as Monroe Doctrine, Oriental Immigration, Fisheries, Shipping Laws, etc., do conflict with the policies of other nations, and that at the present time we do need a very powerful armament.

In times of peace the desire and necessity for economy in government expenditures always lead some otherwise sane men into the folly of pacifism, and the military services are always the first to suffer when cuts in appropriations are deemed necessary.

There is a tendency in that direction now, but the lessons of the World War are still fresh and strong enough to offset it despite the great necessity for economy.

The problem of the day is to find a way to cut down the expense of our military establishments and at the same time maintain our relative strength in the face of existing conflicting national policies.

The consensus of opinion born of our experience in the World War seems to be (a) we *do not need* a very large *standing* army (b) we *do need* a very powerful navy.

But there is a very strong feeling against militarism in this country which expresses itself in opposition to any vast military

establishment, particularly from the standpoint of *personnel* as is especially evidenced concerning the army.

In spite of this feeling against militarism there seems to be a disposition on the part of Congress to provide an adequate navy from the standpoint of *matériel,* an adequate force of regular officers, and a large Naval Reserve of trained men from which we can quickly draw in time of need.

The navy should immediately take advantage of this disposition and formulate a definite policy for itself along these lines:—a plan of organization to maintain a large matériel in the highest possible state of efficiency and readiness with the reduced personnel that Congress is disposed to provide, together with *a reserve organization that will bear a proper relation to the remaining unmanned matériel.*

If the navy should adopt such a policy, and stick to it, and lay its plans in accordance with it, there would be no difficulty in indoctrinating Congress to the navy's needs.

At present there is a habit in the navy of blaming our lack of policy on our form of government and therefore being content with a hand to mouth policy for ourselves.

When the Congress is inclined to favor us we get enthusiastic and take everything we can get Congress to give, oftentimes overreaching along one line of activity without regard to its relation to the whole or to the future.

The present personnel situation is a case in point.

It is the navy itself, the navy's lack of continuing policy, and not the form of government, that is to blame for the ups and downs resulting from the changes of administration and whims of Congress.

The policy outlined below is entirely practical and in the long run will prove more efficient and decidedly *more economical* than the present " Policy of No Policy."

It requires not only reorganization of our Naval Reserve Force, but the establishment of reserve bases.

We do not now possess any such reserve bases. However, with plans already under way for the development of Pacific Coast naval bases, with a new administration about to enter office, and considering the existing urgent demand for economy and the disposition of Congress to favorably consider any proposition that might lead to reducing the cost of the navy, the time is most pro-

pitious for the navy to get together and put such a policy into practice.

The federal administration is chiefly concerned with the maintenance of a navy of sufficient strength to back up its immediate foreign policies and to show the flag in foreign ports, with a reserve capable of expansion to meet any national emergency that might arise from a combination of such powers as may be opposed to its policies.

The Secretary, with the advice of the General Board, informs Congress of the administration's naval requirements; but the responsibility for providing the personnel and matériel and appropriating the funds for construction, maintenance and operation, rests entirely with Congress.

Aside from the General Board's duty and responsibility to properly advise the administration as to its naval requirements for carrying out its foreign-policies, *the navy's chief concern is the efficiency of the personnel and matériel provided.*

EFFICIENCY OF THE ACTIVE PERSONNEL

Since the maximum efficiency of the active navy can only be attained by operation with full complement, it follows that the navy's policy should first require that all ships in active commission be fully manned.

It also follows that only such ships should be kept in commission as can be fully manned with the personnel provided.

If this policy were adhered to we could depend upon the administration to obtain from Congress the authority for the necessary increase of enlisted personnel whenever its foreign policies require an increase in the strength of the active navy.

Since the personnel of the active navy would thus be subject to sudden expansion and since efficiency depends to a great extent on trained officers and chief petty officers, it follows that the navy's policy should next require that its excess officers and chief petty officers be kept in training by being actively employed in naval duties.

EFFICIENCY OF RESERVE PERSONNEL

Since the main purpose of an organized reserve force is to man the reserve ships in case of national emergency, and since effi-

ciency requires not only training of personnel in navy duties and customs but familiarity with the material to be manned, it follows that the navy's policy should next require that the Reserve Force be organized in *ship units* and definitely assigned to reserve ships, and that the reserve ships be kept in condition of readiness for active service.

TO SUM UP PERTINENT FACTS, THE NAVY'S POLICY SHOULD BE

With Respect to Personnel:

(1) To keep the ships in commission fully manned at all times;

(2) To keep excess regular officers and chief petty officers actively engaged in naval duties;

(3) To organize the Reserve Force in ship units and definitely assign them to reserve ships.

With Respect to Matériel:

(4) To keep only such ships in active commission as can be fully manned with the enlisted personnel provided by Congress;

(5) To lay up in reserve all ships for which Congress has not provided regular enlisted personnel;

(6) To provide facilities on shore for keeping reserve ships in such condition of readiness that they can be promptly placed in active service when needed, either in case of national emergency or to replace a unit of the active fleet.

NAVAL BASES AND THE NAVAL RESERVE

I believe that *our greatest naval need to-day is suitable bases for laying up ships in reserve.*

We do not now possess any such suitable bases and we cannot completely carry out the above outlined policy until they are provided.

But now is the time to make a start—with the projected Pacific Coast Naval Base at Alameda, California.

There is a conception in the public mind (and apparently in the naval mind as well, to judge from the loose way in which the term is used) as to the meaning of the term "naval base."

A naval base is a port in which naval activities and facilities for the maintenance and supply of a fleet are located.

Repair yards, dry docks, coaling stations, oil storage depots, supply depots, naval magazines, torpedo depots, receiving ships,

hospitals, marine posts, small arms target ranges, drill grounds, recreation fields, etc., are merely attributes of a naval base, any number of which may go to make up the base, depending upon the character, purpose and strategic position of the base and the composition of the fleet or unit it is intended to serve.

There should be one main naval base on each coast to serve the entire fleet, and they should be located in Chesapeake Bay and in San Francisco Bay, respectively.

The *main naval bases* should, in addition to facilities for repair, docking and supply of the entire fleet, *include reserve bases for the capital ships* of the Atlantic and Pacific fleets.

On the Atlantic coast there should be secondary naval bases at New York and at Pensacola, Florida; with operating bases for destroyers, submarines and aircraft at such other strategic points along the coast line as Portsmouth, Boston (Squantum), Long Island Sound (New London), Charleston, Key West and New Orleans.

On the Pacific coast we should have one secondary naval base at Puget Sound; and operating bases for destroyers, submarines and aircraft at such other strategic points along the coast line as Port Angeles, Astoria, Sausalito, San Pedro and San Diego.

The secondary naval bases should, in addition to facilities for repairing, docking and supply of any one of the units of the fleet, include reserve bases for the cruisers, gunboats, special types and auxiliaries of the reserve fleets.

The destroyer, submarine and aircraft bases in the continental U. S. should, in addition to supply facilities, include reserve bases for destroyers, submarines or aircraft as the case may be.

Fleet operating bases should be located at Guantanamo, Panama, Pearl Harbor and Manila Bay; with destroyer, submarine and aircraft operating bases at strategic points in Alaska (Dutch Harbor and Seward), West Indies (St. Thomas or Porto Rico), Panama, Hawaii, Guam and the Philippines.

The fleet operating bases should each include facilities for repair, docking and supply of the entire fleet.

The destroyer, submarine and aircraft operating bases outside the continental limits of the United States should include only supply facilities for the units they are intended to serve.

All the attributes of a great naval base need not, and I believe should not, be grouped in one place.

For instance, take San Francisco Bay.

The effort to bring about the establishment of a real naval base in San Francisco Bay would never have met with such wilful opposition if there had been a proper conception of the meaning of "a great naval base," not only on the part of the local public affected but of the personnel of the various boards and committees that have been engaged in determining upon the site.

The site of Alameda has finally been chosen; but has the Navy Department any very definite plan as to just what activities or attributes of a great naval base are to be established at this site?

The usual practice in such cases in the past has been to locate a site for a naval station, and then decide what activities to establish there, and let the future needs of the navy determine from time to time what activities shall be added.

Such locations have sometimes been selected through purely political expediency; and, in some cases, even the activities established at naval stations have been established to gratify local political desires and not primarily to fulfil the requirements of the navy, as should be the case.

The result is obvious.

These stations in time become obsolete or inadequate for all the navy's requirements, and incapable of expansion to meet those requirements.

Yet the vested interests of the immediate locality work to prevent abandonment and removal to a better site, or the establishment of additional activities at other sites; and good money continues to be thrown after bad.

This has been especially true in the case under discussion.

The vested interests and jealousies of the city of Vallejo have been able to muster sufficient political power to balk all attempts to establish a naval base in San Francisco Bay capable of handling the Pacific Fleet.

And the country now finds itself in a dangerous state of unpreparedness for war in the Pacific.

Our shore facilities are incapable of handling the entire Pacific Fleet even in time of peace.

Let us therefore avoid past mistakes and first decide on what facilities and activities are required at each strategic point of our coast line before deciding on any definite sites for those activities.

We are now considering San Francisco Bay *as a strategic point* in which a main naval base should be established.

As I have said before in this paper, I believe that *the navy's greatest need to-day is suitable bases for laying up ships in reserve*, and that *each main base should include a reserve base for the capital ships* of the reserve fleet.

I will go into details later as to the exact facilities that should be provided at a reserve base; but suffice it to say now that the first requirement is suitable water frontage, with finger piers to berth the reserve ships, with warehouses on shore for storage of their equipment and supplies, and with sufficient room for expansion of water frontage.

The site at Alameda is admirably situated and wisely chosen for this purpose.

Of the other attributes of a great naval base the repair yards and dry docks are next in importance to be considered.

Except for its distance from the natural center of naval activities in San Francisco Bay, its inaccessibility for both freight and passenger transportation, and the inadequacy of its fresh water supply, there is no reason why Mare Island should not be retained as a ship-building yard, a repair and docking yard for small vessels, a marine regimental post, and a naval hospital.

It is a most suitable site for a naval magazine.

Hunter's Point on the San Francisco shore, directly opposite the Alameda site, appears to be the best location for docking and repair facilities.

These last are purely industrial activities and I can see *no logical reason for grouping* such purely *industrial activities* with other purely *military activities*.

I would therefore suggest that the dry docks and repair yards for the capital ships be located at Hunter's Point and not at Alameda.

The fleet supply department should be located at the Alameda site.

The reason is obvious, the considerations being accessibility to overland transportation, wharfage, proximity to the fleet's anchorage ground in San Francisco Bay, and the fact that *fleet supply is a military activity*.

The coaling station is suitably located at California City, overland transportation not being involved, as steaming coal is carried to this port in floating bottoms by way of Panama Canal and in the future probably from Alaska.

The oil fueling and storage depot should be located in the vicinity of Richmond, where the present pipe lines come in from the California oil fields; with a distributing line from Richmond to the Alameda Base.

The receiving ship (station?) is suitably located at Yerba Buena Island, and should be retained there.

The best location for a destroyer and submarine operating base is in Richardson's Bay, between Sausalito and Belvidere.

This is a long shallow bay, admirably protected and handy to deep clean water and the Golden Gate entrance.

By dredging the lower part between Sausalito and Belvidere Island, and filling the upper part with dredged material, it would provide not only an ideal site for a destroyer and submarine operating base but an ideal field for an aircraft operating base as well.

Suitable locations for small-arms target ranges, accessible by existing rail transportation, can be found in Marin County and in the country back of the Contra Costa Hills.

Navy Department General Order No. 372 of February 28, 1918, recognizes the necessity of removing "from the navy yard organizations, as now operated, certain activities which have no relation to the actual work of the yards, which is industrial, such as receiving ships, marine barracks, naval hospitals, medical supply department, electrical schools, ammunition depots, armed guard activities, and, in order not to unduly tax the storage facilities at the industrial yard, all supply activities and provision for storage designed to meet the requirements of overseas and district patrol activities rather than the actual needs of the yards for work to be undertaken by them."

This general order segregates the activities in each district into the following groups: Military, industrial, supply, transportation.

A perusal of the various general orders and changes in Naval Regulations that have been issued from time to time in regard to Naval Districts, will show that the present organization of Naval Districts is the result of a gradual development through necessity,

and not the result of any well defined preconceived policy at the time of their first establishment.

That being the case, *why not at least start right this time, and segregate the purely military from the industrial activities in our new naval base in San Francisco Bay?*

NAVAL DISTRICTS AND THE NAVAL RESERVE

The country was at war when General Order No. 372 of February 28, 1918, was promulgated, and at that time, of course, there was no immediate necessity for providing for the organization and maintenance of the reserve matériel and personnel on a peace basis.

In General Order No. 519 of March 10, 1920, with certain exceptions, all naval activities outside of Washington are grouped in Naval Districts, and the areas comprised within the various Naval Districts are redefined by "political subdivisions" "in order to facilitate the organization and administration of the Naval Reserve Force."

In General Order No. 522 of March 25, 1920, "The Naval Reserve Force on inactive duty shall be organized in the Naval Districts and assigned to various units in accordance with instructions from the Bureau of Navigation from time to time." This order goes on to define the general organization in "Divisions, Battalions, and Brigades," "depending upon the number of men available."

The whole scheme is very indefinite, and vague, even as regards personnel, and indicates a woeful lack of a policy.

No definite provisions are made for practical training while on inactive duty.

Apparently the idea of organizing the *inactive reserve matériel* has not even been considered.

Certainly no attempt is made to consider it in connection with the organization of the inactive personnel, else the organization ordered for the Naval Reserve Force on inactive duty would be along the lines of *ship units, divisions, and squadrons,* instead of "Divisions," "Battalions," and "Brigades."

OUR FORMER POLICIES WITH RESPECT TO RESERVE MATÉRIEL

Sometime in the latter part of the year 1915, the Navy Department announced a policy in regard to placing ships in reserve about as follows:

To complete the repairs recommended by the Board of Survey before detaching excess personnel—in other words, to put ships in a first-class condition of readiness before actually placing them in reserve.

Although these ships were detached from the fleet and assigned to the reserve fleet immediately after their arrival at the navy yard, they were not to be considered "in reserve" until their repair or overhaul periods were finished; the idea being to insure proper following up and inspection of the repair work by the officers and men who had cruised in the ship and were familiar with her material condition, and to leave some of these officers and men as her reserve complement to care for her while in reserve.

While in command of the Pacific reserve torpedo flotilla, based at Sausalito and Mare Island from 1912 to 1914, I was able, in some instances, to persuade the Bureau of Navigation to revoke its usual orders and permit one officer and the leading petty officers of a destroyer joining the reserve flotilla to remain with their ship.

The usual orders provided for the exchange of crews bodily between the newcomer and her relief.

From 1914 to 1916 I was on duty at Puget Sound Navy Yard, and later in one of the armored cruisers of the Pacific reserve fleet based at that yard.

I do not recall one single instance in all that time, from 1912 until our declaration of war in 1917, in which the Department carried out the policy it announced in 1915 as described above.

I do recall many instances where it was not carried out.

The usual practice was to detach all the officers and most of the old crew within a few weeks after arrival at the navy yard.

In some cases, when a reserve ship was designated to replace one in full commission, practically the entire crews were exchanged bodily, bag and baggage.

The effect of this practice was not only detrimental to matériel, but was most discouraging to the personnel.

The young officers and petty officers of the reserve organization could not hope to retain their temporary responsible positions, even if they were fortunate enough to go with their ship when she was placed in full commission.

There was never a prospect, for them, of being able to enjoy the fruits of the hard work they had performed while in reserve.

It is to the everlasting credit of those officers and men who worked so hard to keep up the material condition of readiness of the reserve ships, in spite of the discouraging conditions described above, that those ships were able to stand up so well in the arduous duties assigned them during the war.

After demobilization we began to drop back into the old rut.

But instead of re-establishing the old reserve fleet we tried to keep up the fleet organization with inadequate personnel, by operating a few capital ships and destroyers with full crews, and the rest "in commission with reduced complement."

Finally the older battleships and armored cruisers were placed out of commission, owing to lack of personnel to man them even with reduced complements.

It is doubtful if these old ships will ever have to be placed in commission again, but on the other hand it is also more than likely that other more modern ships will soon have to be similarly placed out of commission for lack of personnel.

These ships deteriorate rapidly while out of commission.

Their spare parts will deteriorate, be misplaced and lost, or become obsolete.

Their control systems will become obsolete.

Their outfits of equipment will become depleted in store, and the reserve of expendable supplies and dry provisions necessary for recommissioning will disappear and be forgotten.

Then, when the national emergency does arise, these ships will have to be recommissioned at tremendous expense, after great delay, and with a green crew, and they will be of very little fighting value until they have had a long shakedown cruise.

Under present and past policies (or lack of policy) ships in reserve deteriorate almost as rapidly as if out of commission, principally because the work of moving coal and stores and overhauling machinery is beyond the capacity of the small ship's force to perform, and the interiors of bunkers, storerooms and

machinery are therefore neglected in the everlasting effort to keep the visible portions of the ship clean.

This applies as well to ships " in ordinary " under the old system.

Placing ships in reserve instead of out of commission at the end of a cruise also results in an ever increasing accumulation of obsolete material in their equipment storerooms.

STATUS OF SHIPS

Section 2, Article 650, of Chapter 17, U. S. Navy Regulations, 1920, defines the " Status of Ships " as either " in commission " or " out of commission."

Vessels in commission may be in any one of four conditions, as follows:

(a) *In Full Commission.*—Vessels in this condition are fully officered and manned, and ready in all respects for service, and under orders or liable to orders for service without previous notice. They may be temporarily disabled for repairs by orders of the department, however, without changing their status. Such vessels will ordinarily be attached to fleets, special service squadrons, detachments or naval districts.

(b) *In Reduced Commission.*—Vessels in reduced commission are officered and manned with less than 80 per cent of their full complement, but with sufficient complement to maintain the vessel in material readiness for service and to perform such operations as may be necessary to insure efficient performance of the material and to train the personnel. Such vessels will ordinarily be attached to fleets, or naval districts.

(c) *In Commission in Reserve.*—Vessels in this condition shall be maintained at some designated navy yard or other suitable place, and shall be kept ready for sea on short notice. They shall have reduced complements of officers and men on board including, if practicable, an engineer officer and such engineer and artificer personnel as may be required to maintain the material in condition for operation. The provision that they shall be ready for sea on short notice shall not be construed to prevent the carrying on of such repairs as may be necessary to keep them ready for sea, or as may be authorized by the Department, but no work shall be undertaken on any of them that will render them unable to move upon the expiration of four working days after the receipt of orders, without first obtaining permission from the Department. Such vessels will ordinarily be attached to fleets or naval districts.

(d) *In Commission in Ordinary.*—Vessels in this condition shall be maintained at some designated navy yard under the commandant in such manner as will best tend to keep them in condition for service if needed, under detailed instructions from the Department. They shall have complements of officers and men on board only large enough to enable them to be properly cared for in the condition in which ordered to be maintained; their complements shall include, if practicable, an engineer officer and such artificer personnel as may be required. Necessary repairs shall be con-

ducted on them, but no work shall be undertaken on any of them without special permission from the Department which would delay them longer than would be necessary to change them from the condition in ordinary to that of readiness for sea service were no repairs in progress. Such vessels ordinarily will not be attached to fleets but will be maintained in ordinary independently.

Ships Out of Commission.—Ships in this condition shall have no personnel on board, and shall be under the full control of the commandant of the navy yard at which they lie. Repairs and alterations shall be carried on on board them as may be authorized by the Department, or they may be held out of commission and not under repair awaiting the Department's instructions to commission or otherwise dispose of them.

The controlling factor in determining whether a ship shall be in condition (a), (b), or (c), is available personnel.

The controlling factor in determining whether a ship shall be in the status of condition (d) or "out of commission," is condition of material and naval value.

I believe that *ships in active service should be fully manned*, and that *all others that are of any naval value whatever should be kept in reserve.*

I believe further than *no naval ship should ever be placed out of commission, except for the purpose of extensive alterations or to await disposal as of no further naval value.*

I would therefore redefine the "Status of Ships" as follows:

The status of each vessel of the navy will be definitely ordered either as (a) "in active service," (b) "in active reserve," (c) "in ordinary reserve," (d) "out of commission for alterations," or (e) "condemned."

(a) *Ships in Active Service.*—Vessels in this condition are fully officered and manned, and except when temporarily disabled for repairs, ready in all respects for service, and under orders or liable to orders for service without previous notice. Such vessels are ordinarily attached to fleets, special service squadrons, detachments, or naval districts.

(b) *Ships in Active Reserve.*—Vessels in this condition are fully officered, but with reduced crew sufficient only to maintain the vessel in material readiness for service and to perform such operations as may be necessary to insure efficient performance of the material. Such vessels are attached to the active fleets and are available to replace vessels of the active fleets on short notice. They are also available as practice ships for the Naval Reserve Force, the Naval Academy, and other training purposes.

(c) *Ships in Ordinary Reserve.*—All other vessels in commission shall be maintained in this condition at designated reserve bases.

Upon going into ordinary reserve, and before any of the officers or men are detached, all coal must be removed, all portable equipment (except guns, search lights, control installations, furniture, lighting fixtures, and "title A" spare parts) and supplies must be inventoried, tagged and properly stowed in the storehouses provided on shore, and all structural parts, machinery, and appliances must be properly cleaned, painted and otherwise preserved.

Ships in this condition will have sufficient personnel to properly care for the material and to form a nucleus for the Reserve Force when the ship is needed in case of national emergency.

They will be attached to the reserve base under the commandant and their personnel will be suitably quartered and messed on shore.

(d) *Ships Out of Commission for Alterations.*—Ships in this condition shall have no personnel, and shall be under the full control of the superintendent of the dock yard at which they lie.

Repairs and alterations shall be carried out on board them as may be authorized by the Department.

(e) *Condemned Ships.*—Orders for placing ships in this condition will be issued by the Chief of Naval Operations, and such ships shall thereafter be preserved in their present condition at such stations within a district as the commandant of the district may direct, pending further instructions from the Department as to their final disposition.

Naturally these ships will be placed in the condition of "ordinary reserve," before being placed out of commission or condemned.

Vessels maintained in commission shall fly the flag and commission pennant regardless of their service status as defined above.

Vessels out of commission shall not fly the flag or commission pennant.

ADMINISTRATION AND ORGANIZATION OF NAVAL BASES

It will be sufficient for the purpose of this paper to merely mention a few of the points involving changes in Chapter 41 of

Navy Regulations, 1920, without going into details of administration and organization.

Should the policy I have outlined be adopted, such changes as may be necessary will be apparent to those in the office of the Chief of Naval Operations who are charged with the preparation and revision of the Navy Regulations.

These points are:

(1) A naval base should be considered as one of the administrative groups or units of a Naval District.

(2) The headquarters of the commandant of the naval base within the continental United States should be at the reserve base.

(3) The principal administrative establishments that may be included within a naval base, their character, and their administrative officers, should be as indicated in the following table:

ADMINISTRATIVE ESTABLISHMENTS WITHIN A NAVAL BASE

Designation	Character	Administrative Officer
Reserve Base	Military	Commandant—Line.
Supply Depot	Military	Director—Supply Officer.
Ammunition Depot	Military	Officer-in-Charge—Line.
Small Arms Target Range	Military	Officer-in-Charge—Line.
Receiving (Ship) Station	Military	Commanding Officer—Line.
Base Hospital	Military	Commanding Officer—Medical Officer.
Dock Yard	Industrial	Superintendent—Constructor.
Coal Depot	Industrial	Superintendent—Line Engineer
Fuel Oil Depot	Industrial	Superintendent—Line Engineer
Destroyer and Submarine Operating Base	Military	Commanding Officer—Line.
Air Station	Military	Commanding Officer—Line Aviation.

(4) The activities of a reserve base should include the following principal units:

Naval base headquarters.
Branch War College.
Technical trades schools.
Reserve ordnance depot.
Reserve torpedo depot.
Reserve ship units.
Officers club (including mess).
Warrant officers club (including mess).

Chief petty officers club (including mess).
Enlisted men's club.
General mess hall.
Parade grounds.
Recreation field.
Naval hospital.

RESERVE SHIP UNITS

Facilities.—Reserve ship units should comprise the following facilities for maintaining them in the condition of "Ordinary Reserve."

1. Berthing space at finger pier with railroad track leading to storehouses.
2. Equipment storerooms.
3. Boat storage shed.
4. Supply storerooms.
5. Reserve Force outfit storeroom.
6. Crew's dormitory.
7. Offices, with officer of the day sleeping room.
8. Executive officer's quarters.

ADMINISTRATION AND ORGANIZATION

The regular personnel of a capital ship in "ordinary reserve" should include the following:

1. A commanding and executive officer of suitable rank to continue in the office of executive if the ship should be called to active service.
2. As navigator, a line officer of suitable rank to take the duties of senior watch in active service.
3. As engineer officer, a chief machinist or other line officer of suitable rank and experience to assume the duties of assistant engineer in active service.
4. As gunnery officer, a chief ordnance gunner or other line officer.
5. As first lieutenant, a chief carpenter or carpenter.
6. As electrical officer, an electrical gunner or other suitable line officer.
7. As boatswain, a chief boatswain's mate.

8. As ship's writer a chief yeoman capable of taking the duties of captain's yeoman in active service.

9. As supply officer, a supply officer of suitable rank and experience to continue in the duties of general storekeeper in active service.

10. A chief yeoman for the general storekeeper.

11. Such other ratings as may be necessary for watch duty and for preservation of the equipment, supplies, machinery, and structural parts of the ship.

The regular personnel of other ships in this status should include an executive and an engineer and such other officers and men as the type and size of the ship may require.

Men with from sixteen to twenty-five years service should be assigned to ships in ordinary reserve whenever practicable.

The accounts of officers and men regularly attached to ships in ordinary reserve should be carried by the disbursing officer of the reserve base.

The complete outfit of equipment and spare parts should be kept on hand in the equipment storerooms on shore, all properly inventoried, grouped, and suitably tagged with the name and location of the storeroom in which they are to be stowed when on board ship.

The usual allowance of expendable supplies (except ammunition and fuel, which should be kept on hand at the ammunition and fuel depots, respectively), clothing and small stores, and such dry provisions as are not likely to deteriorate, should be kept on hand in original packages in the supply storerooms on shore; all properly inventoried, grouped, and suitably tagged with the name and location of the storeroom in which they are to be stowed when on board ship.

The bag, hammock, and ditty box of each reservist detailed to a ship in ordinary reserve should be *numbered, tagged* with the owner's name, and stowed in suitable racks in the Reserve Force outfit storeroom on shore.

The service records of the reservists detailed to a ship in ordinary reserve should be kept by the executive officer in the same manner as those of the regular crew.

The executive officer should keep in touch with all members of the Reserve Force detailed to the ship, and should furnish each

of them with a station billet, a roster of officers and men, and other pertinent information in regard to their ship and their duties.

The head of each ship department should likewise keep in touch with the reserve personnel detailed to his department.

The mobilization orders for the members of the reserve force detailed to a ship in ordinary reserve should be issued by the executive officer.

The station billets should include individual instructions as to procedure in case of mobilization or call to active duty.

REORGANIZATION OF NAVAL RESERVE FORCE

The Naval Reserve Force should be reorganized and separated into first reserve and second reserve.

The first reserve should comprise those detailed to ships in ordinary reserve and should be organized in ship units.

The second reserve should comprise the Reserve Force general detail list of the naval district, and should not be organized.

The records of members of the first reserve should be carried at the reserve base.

The records of members of the second reserve should be carried at the district headquarters.

Members of the second reserve should be transferred to the first reserve to fill vacancies in ship units.

Members of ship units should be selected as far as practicable from the same locality.

Members of the first reserve should be permitted to wear the uniform *with the cap ribbon of their ship*, on official and social occasions. For this purpose they will be required to retain one blue dress uniform and cotton undershirt. The remainder of their *full* bag outfit will be kept at the reserve base.

Members of the second reserve should not be required to have the uniform, although they may be permitted to wear it on official occasions.

Members of the *first reserve should be paid adequate retainer pay.*

Members of the *second reserve should not receive retainer pay.*

Transfer to the second reserve from the active navy should be substituted for the present "Furlough without pay." (Special Order discharges should be abolished.)

Men so transferred should be placed at the foot of the list of their rating in the general detail, and should not be eligible for transfer to the first reserve until their "number is made."

Transfer from the reserve to the active navy involves losing a place on the list of the general detail should the man desire to return to the reserve before expiration of enlistment.

Men honorably discharged from the active navy are eligible for a place at the head of the list of their rating in the general detail, should they desire to join the reserve.

Ex-members of the first reserve are not entitled to a place on the list of the general detail unless while disenrolled they have completed an enlistment in the active navy.

They must otherwise start again at the foot of the list of the general detail.

Members of the first reserve should be eligible for entrance, at their own request and provided they have the necessary preliminary educational qualifications, to any of the technical trades schools maintained at the reserve bases in their district. Transportation to and subsistence while attending such schools should be at their own expense.

Ships "in active reserve" should be detailed for training the first reserve.

At least two such ships should be detailed to this duty at each reserve base. If the number of first reserves applying for training require it, two groups of such ships should be detailed for this purpose.

These ships should be employed alternately throughout the year in cruises of about one month's duration.

The itinerary and schedule of operations for each of these cruises should be published well in advance by the commander-in-chief of the fleet to which attached.

Each member of the first reserve should be entitled, *but not required*, to take one of these cruises at government expense each year.

Each member of the first reserve should be permitted to take as many more of these cruises as he may desire *at his own expense.*

Each member of the second reserve should be permitted to take as many of these cruises as he may desire *at his own expense.*

Original enrollment in the second reserve should be limited to United States citizens and native-born minors over fifteen years of

age, but such minors are not eligible for advancement to the first reserve until they have reached the age of seventeen with parents' consent or eighteen without parents' consent.

Membership in the first reserve would thus be a coveted privilege that could only be obtained by going through the second reserve or by completing an enlistment in the active navy.

NOTE.—Most of this paper was prepared before receipt of U. S. Navy Regulations, 1920. Attention is invited to the definitions given in Section 2, Article 2050, of Chapter 52, U. S. Navy Regulations, 1920, which coincide in substance with the definitions in this paper.

Attention is also invited to the article by Captain Reginald R. Belknap, U. S. Navy, on "Squantum, the Victory Plant," in the February 1921 number of the PROCEEDINGS of the United States Naval Institute.

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LEADERSHIP OF MEN

By ENSIGN R. F. GOOD, U. S. Navy

We should guarantee to every man his full rights, and exact from every man the full performance of his duty.—THEODORE ROOSEVELT.

In attempting the preparation of a treatise on the subject of "Leadership of Men" it has been necessary for the writer to view the subject from the standpoint of a young officer in charge of a division on board ship, for, to state frankly a fact which will appear to an older reader only too evident, that has been the extent of his experience.

It is not illogical to assume, however, that there are certain fundamental principles of procedure, modified of course by the degree of education and training to which applied, which will prove equally efficient, whether used by a division officer to gain the loyal co-operation of the petty officers and men under his charge or employed by a commander-in-chief to indoctrinate his force commanders. Furthermore, the mental habits acquired by an officer during his first tour of sea duty are apt to be life-long; and for that reason it is all the more important that during these years an officer should come to understand and observe the principles of true leadership.

It is true that some men are "born" leaders; that is, they inherit the essential qualities of leadership. A far greater number acquire leadership by careful study and industrious application. But no man ever had leadership "thrust upon him." Command, yes, but leadership never. Unless a man be heir to the elements of what Napoleon called "the sacred fire" he can win it to himself only by painstaking effort.

It is, therefore, with the aim of presenting the fundamentals and ideals of leadership to the younger generation of officers, not from the pinnacle of senior officer who has fought and won his

battle, but from the standpoint of one actually engaged with his own problem, that this article is undertaken.

LEADERSHIP DEFINED

Webster briefly defines leadership as "the ability to lead." From a military point of view, however, this is scarcely explicit. A more comprehensive definition is arrived at by "putting the cart before the horse." As the object of all leadership is "the achievement, through the acts of men, of a definite purpose or result," so leadership is the means to the end, the procedure by which the leader brings his men, not as individuals alone, but with unified hearts and minds, to direct their efforts toward the attainment of the desired goal.

In this, leadership and morale are inseparably joined. Morale has been broadly defined as the spirit of an organization—its courage, its pride, its loyalty, its stamina. In high morale these qualities (and many others) are found in the superlative degree. Since leadership can operate only through a high morale it is saddled with the two-fold duty of first creating this *esprit de corps* and then administering the force thus created to the accomplishment of the desired end. Some authorities point out that of leadership and morale the latter is the more important, as proof citing instances in which organizations possessing high morale have accomplished much under mediocre leaders. But it must be remembered that such organization was not endowed with this high morale in its infancy. Rather, it will be found that this very morale was conceived and nourished by one who understood the cardinal principles and virtues of leadership.

In a recent address delivered before the Naval War College, Admiral Sims made the following statement: "A fleet of the most powerful vessels would be of little use in war without a personnel at least as efficient as that of our possible enemies." We have, then, in a word, both the meaning and object of leadership (so far as it applies to the military services at any rate); namely, by the creation of a high morale and its scientific administration, the bringing of our personnel to the topmost peak of efficiency. And to do this we must start at the bottom, begin with the relations existent between the division officer and the men under his command. The rest follows as an ascending scale of natural sequence.

STRUCTURAL ANALYSIS OF LEADERSHIP

The physical structure of leadership (if such a structure is assumed to exist for purposes of analysis) corresponds closely to the erection of a permanent building. The wise architect first selects a firm foundation. Next the component parts are manufactured from the raw material. Lastly these various parts are combined in their proper relation to form the completed whole. So it is with leadership. The foundation on which the leader must build is military character. The component parts to be fashioned from the rough are the individuals with whom he works. and the product, if the work be well planned and carefully performed, is a skilled organization of superior morale.

MILITARY CHARACTER THE FOUNDATION OF LEADERSHIP

Character is an intangible attribute, composed of all the virtues and vices of the human race, and broadly classified good or bad as the virtues or vices predominate. The point that must be constantly remembered, however, is that character, like small-pox, is contagious, and if the organization is to possess a good character it must be exposed to that which it is expected to contract. Military character is to the leader that which by force of example will inculcate in the followers the military characteristics which the leader himself exhibits. Military character is to the leader as morale is to the organization. If the leader has a strong military character his command will have high morale.

The measure of military character is, to a certain extent, its very intangibility. But for purposes of exposition it may be assumed to consist of a number of virtues—in military character the vices have no place.

Among the prime requisites of military character (the word among is used here because no effort is made to list these requisites in order of their rightful priority) is knowledge. This knowledge is of two kinds. First the officer who aspires to leadership must "know his job." He must know just what is expected of his unit in the larger organization and the most expeditious and efficient way of carrying it out. If he does not know his division work his leading boatswain's mate can do a better job than he can, and even in a division where spirit is excellent a petty officer who thinks he knows more than his division officer will not hesitate

to confide this opinion to his shipmates. By this it is not meant that a division officer must burden himself needlessly with the myriad details of ship's work. But he must "know how," so that when he is appealed to for specific instructions he can give them clearly, concisely, and without hesitation. Otherwise he must inevitably sacrifice the respect of his petty officer and men for his ability, and loss of respect in any way, shape, or form means lowered morale and decreased efficiency.

In the second place, the successful officer must have a knowledge of men. A superficial knowledge is not sufficient, and in this instance an ounce of actual contact is worth a pound of book psychology. The officer has ever before him the goal of increasing the value of the personnel. This can only be done by elevating the value of the individual. As Von der Goltz puts it: "A general must be a discerner of men. He must look into the hearts of his soldiers, in order to be able to perceive rightly, at each moment, what he can acquire of them." The division officer should know every man under his command by name, surely, for nothing lowers a man's self-respect quite so much as to be called "say you," to be made to feel that he is just one of a lot, that he sunk his individuality when he donned his first suit of work whites. More than this even, the real "discerner of men" will know, in a general way at least, where the man's home is and something of his early environment. In a country as large as ours sectional peculiarities, many of them decades old, are very pronounced, and if the leader would know at each moment what he can acquire of his men a knowledge of what a man's ancestors or associates did under similar circumstances and what characteristics have been handed down to him by years of physical proximity will prove invaluable in forming the estimate.

The second essential of military character is loyalty. Being loyal one's self and having the power to instil loyalty in others is a necessity for the leader. Criticism of superiors or the orders of higher authority breeds disloyalty, and it is only too often that young officers forget this and discuss these matters in the hearing of their men. Many are intensely loyal in obeying orders which meet with their approval but either actually disloyal or passively so through indifference in carrying out instructions which do not appeal to them. Initiative is another matter, and should be encouraged, but initiative does not bestow the prerogative of ques-

tioning an order, once it has been given. Rather, initiative consists of accomplishing to the fullest extent not only what the letter but the spirit of the order dictates. Only by sincere and complete loyalty can that quality be ingrained in others. As one authority expresses it:

> Leaders may look without hesitation to their subordinates for true loyalty to their plans when they have shown by example that they themselves are loyal and capable.

Energy, earnestness, thoroughness, and perseverance are four qualities which, if not inherent, must be cultivated. Unless an officer, and especially a division officer who is much in the sight of his men, attacks his work with energy and earnestness and sticks to it until it is finished in a thorough manner he can look for nothing better than a lackadaisical and slovenly performance of duty on the part of his men.

Too much stress cannot be placed on the item of self-control. No man can expect to control others and bend them to his will unless that will is invincible, unless he is master of himself. An order shouted and embellished with profanity will gain less quick obedience than one delivered in a clean, clear-cut manner, just loud enough to insure its reaching the ears of all who should hear it. The officer who loses his temper will either provide amusement for his subordinates or earn their resentment under ordinary circumstances and in a real crisis will not find the faith and confidence so necessary to success.

Courage, both physical and moral, is indispensable to the man who would be a successful leader. There is perhaps no other quality so much admired in one man by another as sheer physical courage. Even in the face of this, however, courage must be distinguished from foolhardiness. The brave man does not needlessly take long chances for the sole purpose of displaying his courage. Under ordinary conditions on board ship an officer has ample opportunity to demonstrate whether or not he can remain cool and self-possessed in an emergency, and the officer who can do that without ostentation will find that his men have a quiet but all-abiding trust in him when real danger impends. Moral courage is of a higher order than physical courage, and more difficult to obtain and maintain. Yet its recognition is just as prompt and its response more enduring. Under the heading of moral courage is properly classified readiness to bear responsibility. Of this so-

called courage of responsibility, Von der Goltz says: "It is . . . . . strength of mind in high development, schooled to endure the severest trials without swerving from the end in view." It fosters initiative in subordinate leaders and loyalty of the highest order in all who follow.

Last and most important, no one may aspire to leadership who has not the "common" attributes of a gentleman—courtesy, justice, mercy, and a high sense of personal honor. These are all elements of good character in general and form the basis of military character as well. For it follows that unless a leader be courteous he will meet with a surly response; unless he be just and at the same time temper justice with mercy he will not be entitled to and will not receive a "square deal" when his own success depends upon it; and finally, unless his own personal honor is above reproach he can never attain frankness and truthfulness in his relations with others, without which success is and can be only ephemeral.

LEADING THE INDIVIDUAL

Having laid the foundation of leadership in military character, the leader must next direct his energies toward fashioning the component parts of the organization he is to build and control when completed.

No more simple and direct statement of the official relation which should govern between officer and enlisted man can be found than in this brief sentence from the pen of Theodore Roosevelt: "We should guarantee to every man his full rights, and we should exact from every man the full performance of his duty."

In a recent order issued from headquarters of the U. S. Marine Corps, Major General Commandant Lejeune characterizes the ideal relation between officers and enlisted men as comparable to that of teacher to scholar and father to son. In connection with this two late orders from Admiral Wilson, commanding the Atlantic fleet, merit careful attention, one regarding absenteeism in the navy and the other requiring division officers to be present at mast when men from their divisions are on report. In addition to the general knowledge of his duties which an officer should impart to his men in the rôle of teacher is instruction in the dishonor attached to absence over and without leave, a conspicuous phase of dis-

loyalty. One writer scores official personnel on the grounds that while all officers deplore desertion few, if any, ever do anything to prevent it. Many a good man has been lost to the service when a little advance understanding and sympathy might have saved him. Requiring division officers to be present at mast is an amplification of the father to son relationship. There are many arguments for and against an offender that do not appear on his enlistment record, and unless the division officer is on hand with the facts concerning each individual the commanding officer is unquestionably handicapped in dealing out the impartial and withal merciful justice so essential to discipline and to a real understanding between the offender and the authority he has sinned against.

Certain it is that the average enlisted man responds more readily to the mutual square deal than to any other angle of approach. There is something ingrained in every American youth that makes him passionately fond of the spirit of fair play. He doesn't want to be coddled and scoffs at favoritism. But guarantee to him his full rights, share his hardships, commend his efforts to better himself and increase his value to ship and service, deal justly, firmly, impartially, and yet mercifully with his misdeeds; in short, open to him the gates of comradeship based on common loyalty to a common cause—do these things and you have won his respect for you, placed his own self-respect on a pedestal to which he must ever look up, and planted the seeds of a devotion to duty that will make *exaction* of the full performance of that duty unnecessary. He will "deliver the goods" cheerfully and unfailingly in the face of any adversity.

LEADING THE DIVISION

As the strength of the service is the ship, so the strength of the ship is the division. A young officer taking charge of a division composed of green men (as it is almost certain to be in these days of depleted personnel) is confronted with one of the severest trials of his naval career. He must attack his problem carefully and thoughtfully, gradually developing an organization possessing the spirit and knowledge that will make it appreciate its share in making its ship the best in the fleet and its fleet the best in the world.

If the analogy between leadership and building is still followed it is immediately evident that the petty officers form the framework which gives strength and stability to the organization, and to

them the division officer must devote his first and most earnest efforts. Having decided of what leadership consists, he must strive just as diligently to make his petty officers in a true sense leaders of their sections as he does to make himself their leader. He should foster the spirit of initiative and willingness to assume responsibilities in them, and make them in all things the connecting link between the command and its final execution.

"Every group of men working together soon comes to have a soul of its own." The leader who learns to know that spirit has acquired a grip that is invaluable. Having once learned it, he has three means of bending it to his own will in the accomplishment of ordained ends; namely, pride, competition, and faith. Appeal to the pride of an organization, its pride in its good name and its past achievement, and its ensuant endeavor to sustain that pride will prove relentless. Competition is but a species of pride, a pride that is injured when its owner is forced to admit inferiority. The desire to excel is inherent in every individual; no less is it true in any organization. The officer who can intelligently direct this spirit of competition, in athletics, in drill, in all things seamanlike, has a lever at his disposal of incalculable advantage. Finally, let an officer convince his division that he has unbounded faith and confidence in its ability and willingness and it will work long hours under the most trying circumstances to justify that trust. In the face of perfect belief in it on the part of its leader no organization can fail to give a good account of itself.

ACQUIRING LEADERSHIP

To acquire leadership the aspirant must first recognize his problem and face it. By introspection he should make a frank inventory of his qualifications and make every effort to develop those he possesses and to win for himself those he does not. Much can be learned from a study of the lives and characters of famous military and naval leaders, Alexander, Cæsar, Napoleon, Nelson, Farragut, Dewey, and adapting such of their methods as are applicable to present day conditions. More still can be learned by observing superiors who, under conditions more similar to those which now confront us, have established their right to be acknowledged as successful leaders.

To conclude, no officer can set himself a higher or yet more workable standard of leadership than that of the officer who be-

queathed to the United States Navy its greatest legacy of leadership, a standard so perfect that it has been placed on every fitness report as an inspiration to and a measure of attainment. It is embodied in these words of John Paul Jones:

> It is by no means enough that an officer in the navy should be a capable mariner. He must be that, of course, but also a great deal more. He should be, as well, a gentleman of liberal education, refined manner, punctilious courtesy, and the nicest sense of personal honor. . . . . He should be the soul of tact, patience, justice, firmness, and charity. No meritorious act of a subordinate should escape his attention or be left to pass without its reward, if even the reward be only one word of approval. Conversely, he should not be blind to a single fault in any subordinate, though, at the same time, he should be quick and unfailing to distinguish error from malice, thoughtlessness from incompetency, and well-meant shortcoming from heedless or stupid blunder. As he should be universal and impartial in his rewards and approval of merit, so should he be judicial and unbending in his punishment or reproof of misconduct.

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AN INTERNATIONAL OUTLOOK

By Rear Admiral H. S. Knapp, U. S. Navy

The charge may fairly be laid at the door of the people of the United States as a whole that they know little about, and care less for, affairs outside their own country unless they themselves be directly affected. The reasons for this unfortunate indifference, for it is unfortunate, are not difficult to discover. They derive partly from tradition and partly from the conditions and situation of the country in the world. As a young nation, sparsely settled over a long stretch of coast, weak in the face of strong European nations, beginning the national life at a time when weak peoples were the prey of the strong, when the world was full of war and only bginning to admit the right of national groups to a separate national existence, it was natural and proper that the United States should be wary of foreign entanglements and very much on its guard against the suspected or real designs of foreign nations. Nor was the world in that day so interdependent as it is now. Life was then more simple; human needs were simpler; while commerce existed, home production sufficed for most necessities in the United States; the country was practically self-sufficient. This self-sufficiency is to-day more nearly our good fortune than that of any other nation, due to our great extent of territory and diversity of climate and resources; but even we are not self-sufficient. To mention only one important raw material, we do not produce rubber; and how long could we get on without rubber? During the war we found other and very vital needs outside of our own resources.

During the years of our separate national existence the conditions of life of civilized peoples have changed more than during any similar period of the world's history. The steam engine has revolutionized communications and transportation. Of equal or

even greater importance, the steam engine has made possible the great manufacturing establishments that mark the industrial age in which we live. In the more highly civilized nations the trend is distinctly away from agricultural and rural life toward industrial and urban life, and such a change can not fail to modify greatly the characteristics of peoples and the aims of governments. Again, in 1776 verbal communication with persons at a distance was by letter, and letters went over seas by sailing vessels or by slow animal transport over land. Now we have the telegraph and the radio, and it is within immediate possibilities that we may have telephone communication as a regular thing over thousands of miles of land and sea. In verbal communication New York is nearer to-day to Shanghai or Constantinople than it was to Philadelphia during our early days. We are on the eve of regular communication through the air. The whole world—certainly the whole civilized world—is more closely knit together now in the exchange of commodities and information than Georgia and Maine were after the Revolution.

The position and influence of the United States in the world have changed no less remarkably than have the conditions of life of civilized peoples. Our population has increased many fold until now there are only two self-governing countries whose population is greater. Our continental territory is settled from the Atlantic to the Pacific, whereas our independence was achieved at a time when only the Atlantic fringe east of the Alleghenies was settled. Our form of government, never before tried upon so great a scale and regarded with any but friendly sentiments by the monarchical governments of Europe existing when it was inaugurated, long ago passed the experimental stage and justified itself; it has withstood the shocks of time from without and within, and now it is firmly established and held in high respect by the rest of the world. Outside of our solid continental territory we have acquired Alaska, the Hawaiian Islands, Tutuila, Guam, the Philippines, Porto Rico and the Virgin Islands, and have built the Panama Canal and guaranteed the independence of Panama, while with Cuba we have peculiarly close relations that involve both rights and obligations. These external possessions and interests are liabilities from the viewpoint of national defense, and in any event

it is plain that they bring with them additional points of contact with the rest of the world.

These trite facts are instanced to show that a habit of thought that fitted our early conditions is not applicable to the circumstances of our present national life. Young ladies planning for a ball do not plan their costumes on the romper styles of their mud-pie days. Yet I believe that it is a melancholy fact that great numbers of the American people are in the romper stage of thought regarding our place in the world. They live on tradition instead of intelligent appreciation of modern conditions; on catchy phrases adapted to the conditions of our national infancy instead of on the realities of the present day. This was the general national attitude until the Spanish War; that brought to many people the realization that the United States was grown up and had a part to play in the world suitable for an adult nation. More have come to hold a similar belief by the Armageddon through which the world has just passed and the effects of which will be felt by the children's children of the entire world. Many—very many—have not been touched. They believe in isolation as a policy, and believe (or profess to believe) that such a policy is a possibility. They see no responsibility towards other peoples except to sign a check when some "drive" appeals to them. They are apparently afraid that the United States may be "done" if she goes out into the society of the world.

This attitude is no doubt honestly held, even by some who are well informed about conditions outside of the United States and of our points of contact with foreign nations. It is my belief, however, that the great reason for any large mass of opinion in this sense is a lack of information of foreign affairs—or, worse, a lack of any interest in them—and a consequent failure to understand how we are affected. Much too small a proportion of our people have any real, well-founded appreciation of our present-day relationship with foreign nations: one based upon knowledge and not upon phrases uttered by men of great wisdom in our early days but not applicable now. This conviction has been growing with me for many years, and the statement in my opening sentence is one I believe fully justified. Compare the items of foreign news in our press and periodical literature with similar items in the corresponding publications abroad. A writer on the position of foreign

securities in the American market in the March (1920) *Annals of the American Academy of Political and Social Science* says:

> For this (the familiarity of American investors with foreign investments) it will be necessary to have the newspapers and other publications of this country give a great deal more space and attention to foreign conditions than they have heretofore. One of the results of the Great War has been to arouse the interest of the American people in the doings of other lands and to increase their fund of information regarding various foreign governments and the conditions prevailing in other countries.

The March number of the *Annals* is a symposium on Bonds and the Bond Market, and the quoted words did not fall under my eye until this paper had been drafted in the rough. The observations of the writer from a rather restricted viewpoint are what I would stress here from the general and political viewpoint. It has long been in my mind that, while the nation is grown up in size and power, it has not grown up in its knowledge of the rest of the world, nor in an appreciation of its relation to the rest of the world—the political relation that it ought to occupy.

What has all this to do with naval officers? Everything. The navy is the military instrumentality of the government that is always in touch with foreigners. Not infrequently officers have to act in matters abroad without opportunity to seek instructions from the government at home. If it is too much to say that naval officers are responsible for naval policy, it is not too much to say that they are responsible for expert advice upon naval policy. Naval policy depends upon national policy, and national policy necessarily must take cognizance of external relations. If it is to be formulated as befits our place in the world it must be founded upon broader than parochial considerations. From every point of view it is the duty of naval officers to be well informed about foreign nations, and the broader that information and the opinion founded upon it the better able to serve their country in their chosen profession they will be. It is a source of satisfaction that the officers of the navy saw from the first the practical certainty that the United States would be drawn into the recent war if it proved to be at all prolonged. For a time their voice was as that of one "crying in the wilderness"; their justification came in due course. Had their views been accepted the reproach of unpreparedness might have been spared to the country in large measure.

I have been moved to write this paper, not because I feel that the navy as a class has failed in the past to study and understand our foreign relations, but to urge upon all to go on to a greater proficiency in this particular. As a class naval officers should yield to none in an international outlook that is broad and understanding. No officer can come to high command fully prepared for any contingency of service who does not have an intelligent conception of at least the great questions involving the relations of the United States with foreign nations. Naturally and properly the principal interest of the younger officers is in the material of the navy and the training of the personnel; but no officer is too young or too much occupied with his immediate duties to form the habit of knowing what is going on abroad and how it affects us, and of reaching his own intelligent conclusions about our foreign policy in the past and what it should be under the conditions of to-day.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

EUROPE SINCE THE ARMISTICE

A CONDENSED REVIEW OF THE POLITICAL AND MILITARY MOVEMENTS ABROAD

By LIEUT. COMMANDER J. M. CREIGHTON, U. S. Navy

Except for the period just following the downfall of Napoleon, there has been never so complete an alteration of the maps of the world, such a crashing of kingdoms, such a delivery to new commonwealths of the lands of the old, and such a partition among the victors of the wealth of the vanquished as is now in progress in the capitals of Europe. As the end of the Napoleonic wars left the Republican ideas of the French to disturb the permanence of the adjustments of the Congress of Vienna, so the downfall of the Central Empire leaves in the air those upsetting ideas of "Racial Equality," "the Rights of Minorities," and "the Rights of Small Nations,"

The details of readjustments of lands abroad have filled the press daily for nearly two years, and, unless they have been closely followed, a recount of them would be confusing and uninteresting. The endeavor has been made in this review to present the situation in a very general fashion, with no great pains taken in the matter of the precise dates involved, nor the record of many events which, while apparently of moment at the time of their occurrence, proved to be only manifestations of a general development which made its appearance later on.

Whether the agreements arrived at after so many months of inquiry, honest investigation, misrepresentation, bickering, parleys and displays of force will endure is yet to be seen, and a review of the possibilities of disturbance leaves much to be desired in the way of confidence in the stability of all the balanced structures erected at Paris. Russia has yet to be accounted for; the little nations in Central Europe have still to learn their business

of government and settle down; Germany is bound to recover a great measure of her strength, and the questions involving Turkey and all the Mohammedan countries of the east furnish problems as great as they did before 1914.

GREAT BRITAIN

The armistice was declared on November 11, 1918, and on December 3 the first British troops entered Germany. There followed the normal after-war situation; the occupation of the enemy's territory, the release and return home for demobilization of great portions of the armed forces, and the discussion between the victors of what should be the items of the peace.

As has always happened, the disturbances in peoples' lives caused by a great war made the normally-satisfied populations harbor new and disturbing ideas. In the spring of 1919 the first news of widespread outbreaks in Ireland and Egypt, and of unrest in India began to appear in the press. In England, the war's most distinct political aftermath was the rise to power of the labor party.

On March 14 and 15, 1919, there were extensive riots in Egypt, where the Committee of Union and Progress, whose active members had been expelled from Constantinople when the Allies took that city, had been busy in fostering anti-British ideas. Indian, Egyptian and British soldiers were killed in the streets. The police and the army and the native officials remained loyal, and though there was severe fighting in some places the agitation was finally suppressed. In seeking the source of the trouble we find that at the outbreak of the war, the Egyptians were alarmed at England's declaration that her normal supervision of the country had ceased, and that she henceforth would regard Egypt as a distinct British protectorate. The Egyptian idea of independence was not new, but the great garrisons kept there during the war had prevented there being any possibility of a success for it while the conflict was on.

At the peace conference the Egyptian delegates were especially active in endeavoring to obtain a hearing before the Council, but they were prevented from doing so. Upon the continued agitation of the native leaders in Egypt, the English seized them and interned them in Malta. This led to fresh riots in the valley of the Nile, and the arguments of the Egyptians were strengthened by the news

that Syria and Palestine, which had made comparatively slight efforts to obtain their freedom, had been granted a sort of autonomy by the French and British respectively. General Allanby, the conquerer of the Holy Land, was sent from Jerusalem to take charge of the situation in Egypt, while a special commission headed by Lord Milner came out from England to investigate and to make recommendations to the Crown. Upon the return of Lord Milner to England it was rumored that a modified independence was to be given to Egypt, and in August of 1920 England made it known that she intended to adopt in that country a condition of affairs very much like the one the United States established in Cuba. The British are to hold a district on each side of Suez Canal and will garrison it as we do our own district at Panama; the British officials in Egypt will be practically eliminated in the details of local administration, but no treaties are to be made, and no engagements with any foreign interests are to be entered into, without British approval.

In this yielding before the necessities of the situation, the British, while apparently retreating, are yet holding fast to the original idea which caused them to take charge of that portion of the world; that is, to hold in their hands all the steps on the road between England, India and the East. It is apparent that if the Suez district were in the hands of an enemy, or of anyone they should be unable to control, the British hold upon India and affairs in the Orient would cease, and it is to be expected that they will resolutely refuse to compromise their holdings here or in Aden, or at any of the other points where their guarding of the trade routes might be in danger.

In India there has been no such complete lessening of the British authority, but the normal preludes of change have appeared in severe riots, culminating in what has come to be known as the "Massacre of Amritzar," where General Dyer fired upon a large crowd of natives who had assembled contrary to his orders and killed about six hundred of them. At the time it appeared that the effective reverence in which the British have been held in their great native provinces was about to be lost. British officers and men had been killed in the streets in both Egypt and India, and in Amritzar the culmination of the disrespect of the natives came when an English woman was pursued through the streets by a native mob, thrown from her bicycle, and injured. The situation has been described as being similar to that which preceded the

great massacre of the whites in the days of the Sepoy Mutiny, and General Dyer proceeded to firmly suppress all signs of disturbance. He was later called to England and had a severe time of it defending himself for his actions in this emergency.

In the Pathan lands to the north and west of the peninsula there has been severe and persistent fighting for two years, and this is still in progress. In Persia and Afghanistan the British influence has been upset by the Bolsheviks, operating from their propaganda base for the east at Tashkend. A great deal of submerged political conflict had its evidence in the murder of the Emir of Afghanistan and of his being followed by another prince more favorable to the British. There was announced, shortly after the war, a British treaty with Persia which practically gave to them the entire supervision of the country. This has been more or less compromised by the landing of the Bolsheviks at Enzeli on the Caspian Sea and of their penetration south from that point.

Farther to the west the English have taken over the mandate for Mesopotamia, established their headquarters at Bagdad, and assumed control of the rich oil region at Mosul.

It has been necessary to maintain a very large British army in this district ever since the armistice. The fighting of the natives for independence has been no less active here than in the French district of Syria or farther north around the Greek port of Smyrna. The British line from Basra, the entry port at the mouth of the Euphrates river, to Bagdad has been repeatedly cut, and in response to objections in the Parliament to the expenses of the campaign the British have decided to abandon the country, except for a small district around the mouth of the river called the Vilayet of Basra. However they have created in their rear the "Kingdom of Irak," which is the name given to the district about Bagdad, and have given the kingship to a native chief loyal to them, named Emir Abdullah.

The entire situation in the Near East is extremely complicated, and if you will take the map which accompanies this article in your hand, and patiently endeavor to find all the strange names on it, I shall try to make clear the different spheres which the various powers have taken in the lands of the old Turkish Empire, and what has been happening there since the war ended.

Following up the British zones of supervision, you will see on the border of the Red Sea the Kingdom of Hadjez. The erection of

THE SPHERES OF CONTROL OF THE POWERS IN ASIA-MINOR.

this kingdom under King Hussain, a prince friendly to the British, and the father of Abdullah of Irak, was the counter to the Turkish declaration of a holy war. Mecca, the Mohammedan holy city, lies within it, and in securing the adhesion of King Hussain the British promised him, that if the war was successful for them, the Arab state should extend well into the north and include the country about Damascus.

To the northward, along the western side of Arabia, we come to the British district of the Canal and Palestine, and then, at Akka, advance into the French district of Syria, including the ports of Alexandretta and Beirut.

Adjoining the French district on the north is a district allotted to Italy, centering about Konia, and containing the coal fields of Heraclea. Then comes a stretch of coast line to which none of the Europeans has laid definite claim. The Greek district comes next, centered at Smyrna and including a number of islands off the coast.

The Supreme Council created the Zone of the Straits, administered by an allied commission on which England, France, Italy and Greece are represented, and which controls Constantinople, the Sea of Marmora, the Straits and the islands lying off its mouth.

These districts were apportioned to the various countries at the conference of San Remo in April, 1920, and the subjugation of the country was left to the nations concerned. In Palestine the British, with their usual success in dealing with native people, have so far managed to operate with very little apparent trouble. To the north of them the French have declared the independence of the district of Lebanon, which, ever since France defended the inhabitants from massacre at the hands of the Turks in 1864, has been a district loyal to her. Elsewhere, when they have attempted to extend their authority they have been met by both the opposition of the Arabs, led by Emir Feisal, another son of King Hussain of Hadjez, and that of the Turks, under Mustapha Kemel Pasha. The French armed the native Armenians, who have plenty of reason to fight the Turks, and very severe massacres of these people have marked the progress of the occupation of this district of Asia-Minor.

Emir Feisal had his headquarters at Damascus. The French proclaimed that they wished the native population to choose their own leader for the local government, and on March 8, 1920, they

did so, and Emir Feisal was elected King of Greater Syria by the Pan-Syrian Congress at Damascus. He immediately declared the independence of Syria and invited the French and English to leave the country. In the conflict which followed, the French under General Gauraud occupied Damascus, killed Feisal's Minister of War, and expelled Feisal from the country. At present the French are holding the district but fighting almost constantly on the outskirts, and planning to vacate Cilicia in an endeavor to placate the Turks under Kemel Pasha.

In the conference at San Remo in April, 1920, the decision was reached between France and Great Britain to prosecute the war against the Turkish Nationalists, and as they were both too occupied elsewhere to undertake the necessary operations, they granted the request of the Greek Premier, Venizelos, to be allowed to undertake the work with the Greek army. In addition to the district about Smyrna, Greece was also given all of Thrace up to the Tchataldja lines, just outside Constantinople, where the Balkan armies were stopped in the war of 1912. She promptly landed two large armies, one in Thrace and one in Smyrna, and both started east. The investment of Thrace was carried out with very little trouble, the Greeks defeating the Turkish-Bulgarian force at Adrianople and capturing the leader. East of Smyrna there was heavy fighting. The British assisted by bombarding the Turkish fortifications along the south shores of the Sea of Marmora, and especially at Ismid, where the battleships were reported to have killed a thousand Turks in their shelling of the trenches. To assist the Greek army east of Smyrna another Greek force came south from the Sea of Marmora, and later on a third army started from Ineboli on the Black Sea for the Nationalist capital at Angora. The fighting everywhere went against the Turks, who retreated farther into the interior. For a long time the news of the Greek army became scarce in the papers, and it was only in November of last year that the disintegration of the Greek morale resulting from the contest at home between the followers of Venizelos and ex-King Constantine became known.

As the result of the Turkish Peace Treaty (the Treaty of Sèvres), signed August 10, 1920, Greece has been greatly enlarged, but England and France have kept control of the Dardanelles and

the islands off its mouth by creating the "Zone of the Straits," administered by an allied commission.

As this is written (March, 1921), the premiers of England, France and Italy are in conference in London, in an endeavor to

THE NEW SITUATION AT THE DARDANELLES.

change the Turkish treaty to make it more agreeable to those nations who participate in its provisions. In the modifications which are forecast, it is expected that Greece will suffer a reduction of the territory which was given to her premier, Venizelos, at San Remo last year, and that the Turks will correspondingly gain in the alterations to the treaty.

FRANCE

The domestic history of France has been strangely at contrast with that of her neighbors in that it has been almost free from internal dissension. Within six months after the war there were several serious disturbances of labor, but they were very firmly handled and no serious results occurred. When the Third Internationale met at Moscow there was a determined effort on the part of the radicals of the French labor parties to secure a public declaration of their adherence to the Moscow meeting, but the moderate elements in the French conference were in the majority. France has had no local disturbances in any way as diverting as those of England, Germany, or Italy, and her peace at home has allowed her to take a prominent part in all the important operations outside her boundaries, and these have brought her a great prestige on the continent.

In the settlements of the details of the peace treaty she has, for several reasons, been forced to fight against the opposition of England and Italy, while assisted in a slight measure by Belgium. France and her little neighbor on her north have been driven into a mutual foreign policy of determining that the Germans shall remain weak now that their desperate defence is over, and they have signed an armed agreement to assist each other in case either is attacked again.

There have been various meetings of the premiers of Italy, France and England to determine upon the details of the carrying out of the treaty of Versailles, and both sides have been forced to make concessions. The French point of view was vigorously and determinedly defended by Premier Millerand, now the president. At one time it appeared that the Germans were planning to break the agreement concerning the number of troops to be placed in the neutral zones along the Rhine and, failing to secure the English cooperation, the French resolutely went ahead without them and occupied Frankfort, Darmstadt and Hanau, on April 6, 1919. The troops stayed in these important cities until the Germans withdrew all excess troops from the district and then, on May 17, marched out. This strong and determined action on the part of the French markedly enhanced their position in all subsequent operations of European politics, but their great success was yet to come in their assistance to Poland on the east, when they held her together in her hours of danger from the Red armies of Russia.

In the old days before the war, an alliance with Russia was the normal means of weakening Germany by strengthening the power to the east of her, and now, with Russia down and Poland up, the French are determined to strengthen and stabilize the latter.

The great mineral wealth of Germany lay in the deposits of potash, coal and iron in Alsace-Lorraine, and other deposits of coal and iron, no less important than the first, in upper Silesia. The first of course, has gone to France, and the second is to go either to Poland or to Germany according to the result of the plebiscite to be held there. Both French and British troops were sent into the district to supervise the election, but a great many of the English officers have resigned, and it is generally conceded that the situation lies in the hands of the French. The district is one of the richest in Europe and the Germans are desperate to keep it; to weaken them, and to assist the Poles, the French are just as determined that they shall not have it, and the elections, already twice delayed, are expected to take place in April.

Taking advantage of Bolshevik weakness in the Spring of 1920, the Poles made an alliance with the Ukranian opponents of the Reds in South Russia, and in April started east with them in a wide sweep of conquest. In early May they took the important city of Kiev and started south for Odessa. For a few days the news from the front was indefinite, and then came report after report of Polish defeats as the Reds took advantage of their thinned-out defenses in the north, broke through them and drove straight for Warsaw. There followed three weeks of headlong retreat and equally rapid advance, with stories of armies wiped out and great areas overrun and ruined. Just as the world was prepared for the news of the downfall of the Polish capital, a remarkable rally of the defenders occurred, coincidentally with the arrival of fresh Polish troops from the south (and of a French military mission under command of General Weygand, Foch's chief of staff). There resulted an almost miraculous saving of Warsaw, and an overwhelming defeat of the Russians, with the capture of about a hundred thousand prisoners. The Poles promptly took up the pursuit and drove the Russians before them some three hundred miles to the points which they occupy at present. These are the same lines at which the Germans stopped after their victories over the Russians in the

world's war, and represent the only feasible line of defence for Poland from the attack from the east.

The success of the Polish war has put France in her old place in political and military supremacy among all the nations on the continent, and in the Polish victory she has not only saved her own ideas of having a strong friend to the east of Germany, but has

■. Plebescite areas.
A Boundaries fixed by the Supreme Council at Paris.
B The Russo-Polish battle line in June, 1920, before the Reds drove in and nearly captured Warsaw.
C Poland's boundaries before the partition of 1772. Vilna, the seat of the Polish-Lithuanian trouble, is shown underlined.

practically saved Europe from what might easily have been an overwhelming flood of the Soviet idea. The radical elements of Germany were only awaiting the arrival of the Russians in East Prussia to join with them, and as Germany had nothing but desperation ahead in carrying out the present treaty, and at least a distinct chance of relief if they joined with victorious Russians,

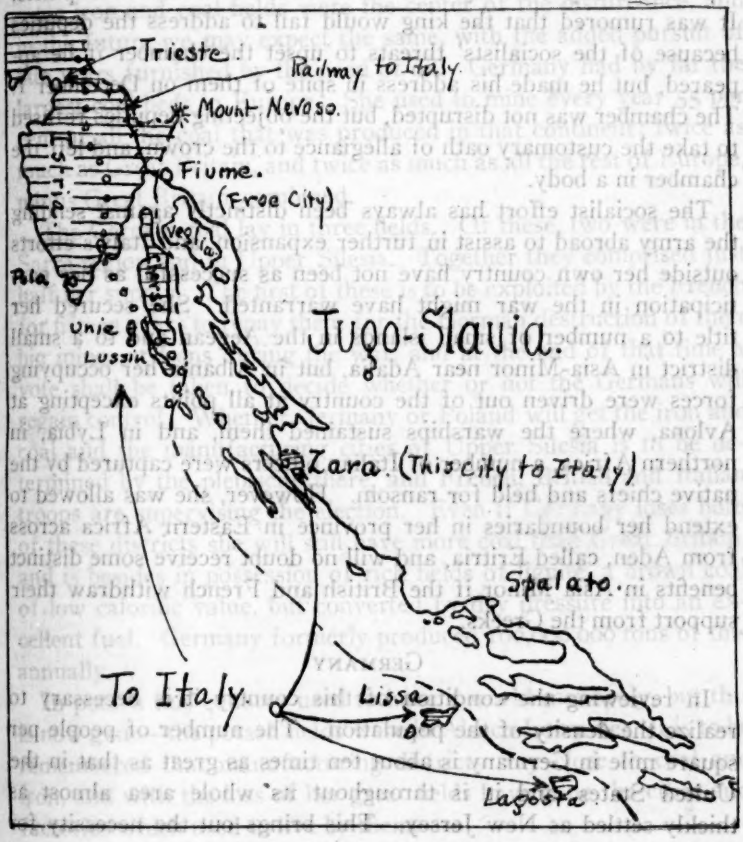
this upsetting of Germany and Hungary, and perhaps disturbed Italy on the side, might have gone ahead in the flood of success if Warsaw had gone down. The French interests in Asia-Minor have already been mentioned, and she now occupies, with England, that intimate Inner Chamber where most of the affairs of Europe are being discussed and decided.

ITALY

The Italian situation has been a confused jumble ever since the end of the war. Italy lost a great many men and spent a great deal of money in her campaigns, and in addition to having very few vivifying successes to cheer her on, she has felt that she was very badly treated, both at the peace conference and since. In the north, however, she has finally acquired all that it was possible to give her. Her old cry of "Italia Irredenta" has now little basis in fact. The end of the Austrian wars in the 19th century left most of the commanding positions and the mountain passes in the hands of her enemies, and her efforts in this war were hampered in every way by fighting against the tremendous obstacles which the old Austrian generals planned for her when they framed the peace treaties. Now Italy occupies all these mountain passes herself, and controls all the strategic paths into her country, including the whole district of South Tyrol, where some five hundred thousand German-Austrians are brought under their authority. By the treaty of Rapallo, signed with the Jugo-Slavs in November of 1920, the Italian territory is carried around the north of the Adriatic, almost touching the free city of Fiume, and including the islands lying off that port, which to all intents and purposes control its operation. There is very little endeavor made to conceal the fact that the declaration of the status of Fiume as a free city is only a step on its way to becoming actual Italian territory. The original Italian demand was for the whole Dalmatian coast, but after negotiations extending over a year, and a number of small local fights between the Italians and the Jugo-Slavs, including the spectacular performances of d'Annunzio, they have apparently arrived at a satisfactory agreement with their eastern neighbors.

By the provisions of the Treaty of Rapallo, Fiume was given the status of an independent state, whose territory joined that of

Italy on the west. The islands of Cherso, Unie and Lussin go to Italy, as well as the detached city of Zara and the southern islands of Lissa and Lacosta. Mount Nevoso is a commanding elevation



THE SETTLEMENT OF FIUME.

o o o o The "Wilson Line."

– – – – The line agreed upon between Italy and the Jugo-Slavs at Rapallo, November 10, 1920.

in this region, and that too is in Italy's territory. About 500,000 Serbs are included in these new Italian lands.

Italy has been hampered in her foreign policy by a most dangerous lack of stability at home. There have been repeated strikes, with railroads stopped and factories shut up; with martial law,

soviets set up in the cities, and great manufacturing districts forcibly taken over by the workers. In the elections in the autumn of 1919 the radical socialists had a great increase in strength and captured nearly one-third of the seats in the Chamber of Deputies. It was rumored that the king would fail to address the deputies because of the socialists' threats to upset the chamber if he appeared, but he made his address in spite of them on December 1. The chamber was not disrupted, but the objecting deputies refused to take the customary oath of allegiance to the crown, and left the chamber in a body.

The socialist effort has always been distinctly against sending the army abroad to assist in further expansion, and Italy's efforts outside her own country have not been as successful as her participation in the war might have warranted. She secured her title to a number of small islands in the Aegean and to a small district in Asia-Minor near Adalia, but in Albania her occupying forces were driven out of the country at all points excepting at Avlona, where the warships sustained them, and in Lybia, in northern Africa, a number of Italian officers were captured by the native chiefs and held for ransom. However, she was allowed to extend her boundaries in her province in Eastern Africa across from Aden, called Eritria, and will no doubt receive some distinct benefits in Asia Minor if the British and French withdraw their support from the Greeks.

GERMANY

In reviewing the condition of this country it is necessary to realize the density of the population. The number of people per square mile in Germany is about ten times as great as that in the United States, and it is throughout its whole area almost as thickly settled as New Jersey. This brings out the necessity for her intense cultivation of the land and the development of manufactures in order to support such a large population, and her consequent demand for raw materials with which to feed the factories.

Though the actual territorial losses (and the ones which will result if all the plebiscites go against Germany) amount to only 14 per cent of her area, this land includes over 20 per cent of her former agricultural region and practically half of her coal and iron. Before the war the Germans produced twice as much iron and steel as did Great Britain, and they also imported a great deal of ore from Sweden, Spain and Algeria. Of her great fields,

80 per cent of the iron ore lay in Lorraine, and the 20 per cent left to her is of inferior quality and distributed in small beds.

Coal has always been the heart of business. In all the wars of the past, excepting those of a religious character, it is generally to be found that under the covering of high-minded utterances some iron and coal fields were the center of the disturbance, and in the future we may expect the same, with the added pursuit of late years furnished by the need of oil. Germany had by far the largest coal beds in Europe. She used to mine every year 55 per cent of all the coal that was produced in that continent; twice as much as Great Britain, and twice as much as all the rest of Europe, minus Great Britain, combined.

The German coal lay in three fields. Of these, two were in the Sarre region and in Upper Silesia. Together they comprised just half her supply. The first of these is to be exploited by the French for fifteen years to repay them for the German destruction of their big mines at Lens during the war, and at the end of that time a vote shall be taken to decide whether or not the Germans will regain control. Whether Germany or Poland will get the iron and coal and the manufacturing cities of Upper Silesia is to be determined by the plebiscite there, and French, British and Italian troops are supervising the election. Even if Germany loses both of these districts she will still have more coal than Great Britain, and is besides in possession of rich fields of lignite, a brown coal of low calorific value, but converted by dry pressure into an excellent fuel. Germany formerly produced 100,000,000 tons of this annually.

In potash this country used to have a world monopoly, but this is now gone—the potash fields were in Alsace-Lorraine. It is to be remembered that manufacturing districts stay close to coal and iron, and with the loss of her great fields have gone the cities and factories which used to live by them.

During the war the expenses of the German government were piled up with the utmost extravagance. It was planned to have the Allies pay the cost of the war as France did, twice over, in 1870. After the armistice there was no let-down in the uncurbed dispersion of the country's money. The new government tried to please everybody, and pleasing everybody meant subsidizing them to ease the cost of their living. So the government's debts piled to the skies, the value of the mark went lower and lower, and the country went deeper and deeper into its troubles. With the coal and the

iron have gone her ships, and the great merchant fleets which six years ago were pushing the British hard for first place in the world are now completely obliterated. Her once fine railroad equipment has been cut to pieces by the delivery of hundreds of locomotives and thousands of cars to the French and Belgians, and the floating docks, and derricks, and barges, which were to assist her in rebuilding her merchant shipping, have been taken away to repay for the piece of work which made June 23, 1919, such a big day for salvage parties at Scapa Flow.

The republican government which brought a harness maker in to take the place of the departed Hohenzollern has weathered many desperate storms and is still in the saddle. In January, 1919, there were severe Spartacan, or radical, riots over the entire country and it appeared at times that the government would be overthrown. On the 15th of that month Rosa Luxemberg and Karl Liebknecht, the principal radical disturbers, were killed in a fight in the streets of Berlin. On February 6 the new government was established at Weimar, with Ebert as president.

During February and March the disorders continued, with idleness, no trains, and general food shortage helping things along. The coal production in the Ruhr district dropped to 10 per cent of normal, while the railroads were already operating but a small number of trains because of the lack of fuel.

In February, Bavaria broke out in revolt. An officer shot Kurt Eisner, the premier, and was in turn killed at once by a sailor. Munich was in a riot, the crowd searching for all opponents to the Soviet, and in the course of the operations Prince Joachim was arrested and ex-King Ludwig left during the night for Switzerland. The Soviet took control.

On March 3 a general strike was declared in Berlin. The Prussian government proclaimed a state of siege, and Noske came into power. During the night of March 3, 28,000 men under General Von Luttwitz entered Berlin. On March 5 there was fighting all over the city and its environs, and on the 8th the government troops had cleared the center of the area. On the 11th the Spartacans asked for an armistice, upon which the government forces cleared the suburb by attack.

On April 7, 1910, a Soviet was set up in Munich, Bavaria, and the central government openly defied. Then Saxony went down

with widespread strikes in all her industries. There was extreme violence in Dresden. Noske's troops finally attacked and took the city, and on May 2 the Soviet in Munich was also ended.

By August the internal conditions had settled down to a milder character, disturbed perhaps, instead of revolutionary. The government was unavoidably facing conditions which were bound to make it unpopular. It was very easy to blame everything unpleasant on the party in power and very unlike human beings to credit it with any effective or sincere effort. Tides of refugees from the areas given over to Poland began to pour into the district about Berlin with all the miserable Tales of the Dispossessed. The actual signing of the peace treaty was still to be met, and every item of it meant a fresh groan from the German people at home.

In late January of 1920 Berlin was again in the hands of a mob, and their disturbances culminated in an attack upon the Reichstag building. The police seem to have been very reluctant to fire on the crowd, but, having decided to do so, did the job with true German thoroughness and killed forty-two and wounded over a hundred in something less than a minute of firing. This ended the demonstration for that particular afternoon.

With the arrival of the official peace, Germany was filled with widespread despair. The shops were in the hands of Councils of Workmen. There was a paralyzing lack of any raw material from which goods were manufactured. The transportation was even worse than in the fall, and the production of that great essential, coal, had increasingly fallen down.

Up in the northwest part of Old Russia, a large German army of about fifty thousand men had been maintaining themselves in the region called Courland, ever since the armistice. They had persistently neglected to obey the summons of the Supreme Council at Paris to return inside their own borders, and the government at Berlin was forced to confess that they had repeatedly ordered them home but had no means of making them obey. They were finally driven back into Russia by the native Letts, backed by the French and English, and became the forces which in March, 1920, under General Kapp, attempted a restoration of the Monarchists. This revolt lasted three days. President Ebert left Berlin as the troops entered. That afternoon a general strike throughout Germany stopped all work in the country, and on the 16th of March General Kapp, unable to swing the people in behind him, marched his army out of the city.

On March 27 the Spartacan revolt in the rich district of the Ruhr broke out and the Reichwehr, the government army, advanced to crush it. There followed heavy fighting between the armed workmen and the government forces, and as the soldiers continued to pour in, the French called attention to the fact that only a definite number of German troops were allowed in this section by the peace treaty and that the number agreed upon was being exceeded. Upon the continued increase of the Reichwehr forces, France, driven by the fear that the Germans would break all the provisions of the treaty if they could establish a precedent by breaking this one, and unable to secure cooperation from any of her Allies, moved her troops into the Rhine cities of Frankfort, Darmstadt and Hanau. By the middle of April the Germans put down the disturbances in the Ruhr and withdrew the excess troops, and on the 17th of May the French moved out of these cities on the east bank of the Rhine.

In early June there was severe fighting between German civilians and the French troops in Upper Silesia, the latter being there to supervise the elections which were to decide whether this rich territory was to belong to Poland or Germany. The Poles moved heavy forces to the Silesian border and the French declared martial law in the district under their charge.

On July 5 the first conference at which the Germans were admitted to a discussion with the Allies opened at Spa, with representatives from England, France, Belgium, and Italy. Previous to this there had been a number of meetings between the premiers of the four allied countries to determine upon a common platform at Spa, and in spite of the vigorous efforts to have some of the terms of the treaty modified, the Germans got very little out of this conference to add to their comfort.

They had been repeatedly failing to carry out the provisions of the treaty relating to the reduction of their forces, the delivery of war material to the Allies and the monthly allotments of coal to France. It was due to the firm and relentless attitude of the French premier that the conference ended with a German agreement to go about immediately with the reduction of their troops, to guarantee a steady monthly delivery of two million tons of coal to France, and to proceed at once with a trial of those persons designated by the Allies as war criminals. On September 22, it was announced that the Germans had finished the delivery to the

Allies of two million tons of steamers and sailing craft, virtually all that was agreed to at Versailles.

Politically, the German effort may be taken as follows: It is to be assumed that her expansion and influence are entirely blanked off in the west. In the south, however, there are millions of Germans in old Austria whom she seeks to get under her colors, and one may expect her to maintain a steady effort to have these racially-allied people brought into her political sphere. Germany's best chance of alliance and expansion thus lies to the east, and this means that she will work day and night to pull down the newly-established and sorely-tried country of the Poles. In this she will be met by the assistance of the Russians, with whom it will be logical for Germany to join herself when the Soviet ideas have become sufficiently normal to relieve the Germans of the fear that their own government will be carried away by the alliance.

RUSSIA

On March 12, 1917, the revolution began, and the Czar abdicated on the 15th. An army of 12,000,000 men was then organized by the revolutionary leaders, and on July 8 Kerensky led it into Galicia. In a battle with the Germans, the way for the attack had been successfully opened by the artillery, but before going over with the infantry the war was held up while a plebiscite was taken in the trenches to determine whether or not the majority wished to advance. In the midst of this genial discussion the Germans attacked on their own hook and started a panic and retreat which was terminated only by the fact that the pursuers were unable to advance as far as the Russians retired.

The German agents in Petrograd now succeeded in undermining the authority of the Kerensky faction and formed in opposition to it the famous Red Guard, which finally proved the undoing of its creators.

On July 3, Kerensky repulsed the first attempt by the Guard to come into power, but his measures to prevent a repetition of the effort were too weak, and in October he was overthrown and fled to England.

The Germans were at this time in Helsingfors, Pskov and Kiev, and their faction, led by Lenine and Trotsky, now executed the treaty of Brest-Litovsk and thus released the German troops for operations on the western front. Count Mirbach (afterward assassinated) was sent to Moscow as the German representative,

and the great quantities of munitions, food, grain, explosives and coal which had been stored for the Russian armies, began to take the road west to Germany. Russia, deserted by her old allies, despoiled of her supplies, shorn of her strength, and in the grip of the Bolshevik reign of terror, passed into the darkness of the revolt.

From that day to this the intricate history of Russia is one long series of attempts by the old Czarist factions, assisted by England and France, to overthrow the power of the Bolshevik government in Russia. The Japanese also took an important part in this operation and extended their influence at various times as far west in Siberia as Lake Baikal. Probably the most romantic picture of the many campaigns is that of the Czech army, taken prisoners by the Russians during the war, arming themselves after the breakdown of Russia, taking charge of the Siberian railroad and advancing, fighting all the way, to Vladivostok, where American ships finally took them out and back to their old home country. Our own participation in Siberia was not extensive, and as the situation became tense there and the demand grew at home for the return of the soldiers, our troops were withdrawn.

The Soviet forces have defeated in succession the armies of Kolchak in Siberia, Judenitch in the northwest, Denekin (backed by French and Rumanian troops) in the district north of Odessa, and after him, the revived remnants of this former army under Baron Wrangel. In the spring of 1920 the Poles advanced deep into South Russia with their allies, the Ukranians, and advanced as far as Kiev. They were driven clear back into Poland however, in May, and the capital was saved only by the timely arrival of French officers and munitions. Following this the Poles severely defeated the Russians and exacted from them armistice conditions which left their boundaries advanced to the lines formerly occupied by the Germans after their great defeats of the Russians in 1915.

At present the Bolsheviki are in undisturbed control of most of the territory formerly belonging to the old Russian Empire, excepting in Poland and Eastern Siberia. Their ideas are seriously threatening the lands of the English and the French in Asia-Minor, Mesopotamia, Persia and India, and it is expected that spring will witness a determined attack upon the Poles. Meanwhile there is a growing tendency, led by the English, to establish commercial relations with them, and it is not denied that this is a natural and logical prelude to their recognition.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A LABOR SAVING AND MORE EFFICIENT METHOD OF DAILY ANALYSIS OF ENGINEERING PERFORMANCE

By LIEUT. COMMANDER W. L. MOORE, U. S. Navy

The need for some form of daily analysis of the performance of the engineering plant of a ship is well recognized, but the use of such an analysis is not so universal as it should be.

Among the reasons for this condition, the following three (3) may be counted as probably the most important:

(a) Lack of necessary data.

(b) Time and labor required to pick off the data from performance curves.

(c) Lack of understanding of the use and value of the analysis after the form given in the Rules for Engineering Performances.

Reasons (a) and (b) may be traced largely to the universal practice of presenting performance data in the form of curves.

It is true that much data can best be recorded in the form of curves and that curves are indispensable in many cases, yet practically all of the data needed by the operating engineer can be given in the form of the simple algebraic equations which are simpler and easier to use than the curves giving the same data. This is for somewhat the same reason that in many cases the azimuth tables are more convenient than Weir's Diagram.

The data needed to make an analysis is contained in the curves of total steam consumption per hour *vs.* H. P., or *vs.* some other fundamental reading of the performance of the machine. Examine the curves for a number of auxiliaries and it will be noted that these lines, the "Willans Lines," are straight within the working range of the machine, or so nearly straight that with only slight inaccuracy a straight line may be drawn through all the plotted test points which located the curve.

Any straight line can be expressed by an equation of the form

$$y = a + bx$$

where a is a constant—the intercept on the y-axis,
and b is a constant—the slope of the line.
y and x the variables.

Applying this to the consumption curves of auxiliaries, there can be obtained the following equations:

For a reciprocating engine:

$$W = A + Bh$$

where W = Pounds steam per hour (total)
h = H. P.

This in some cases may be written

$$W_1 = A_1 + B_1 R$$

where R = R. P. M.

For a pump:

$$W = A + BS$$

where S = Double strokes per minute.

For a generator:

$$W = A + BK$$

where K = Kilowatts output

or $W_1 = A_1 + B_1 I$

where I = Load in amperes.

For a turbine with first stage pressure less than .58 inlet pressure:

$$W = A + BP$$

where P = Steam chest pressure absolute
$A = O$.

(This formula corresponds to that for a flow through an orifice W per sec $= AP/70$).

A number of equations derived in this way for destroyer auxiliaries are given at the end of this article. Several are taken from curves given by Lieutenant Commander Osgood in an article on "Daily Analysis," in the August 1920 number of the Institute PROCEEDINGS. These equations should be checked against the corresponding curves to check the validity of the assertations made herein.

It is to be noted that all the equations represent actual test data and are not theoretically derived. Also, that an equation is ap-

plicable over only the same conditions that the corresponding curve is applicable, *i. e.*, if the equation is given for the consumption of a pump at 300-pound discharge pressure, and 5-pound back pressure, another equation would be necessary for 100-pound discharge pressure or 15-pound back pressure, just as another curve would be required.

Note also that the equations for the consumption of turbines based on inlet pressure are independent of H. P., R. P. M., Discharge Pressure, Air Pressure, and within the ordinary range of pressures of Back Pressure.

Consideration of the equations at the end of this article will show the following advantages over curves:

(a) They are so simple that they can be worked out in many cases by mental arithmetic.

(b) They are very compact. A number can be included in very small space.

(c) They give data in a form which can be duplicated and disseminated by the typewriter or printer. This eliminates the need of tracings and blue prints and the expense and labor of making them. The Department could compile a great amount of data in a small pamphlet, and keep this pamphlet up to date through the confidential bulletins, a service of which the cost would be prohibitive if curves were used. Each engineer officer of a ship, when he conducted a water-rate test, could report his results in a form which would be immediately available for dissemination to the service.

(d) For reasons (a), (b), and (c), the data for all auxiliaries can be printed on one form for the daily analysis as illustrated in the sample form appended. This relieves the engineer officer of the necessity of thumbing through a sheaf of blueprints each time he makes an analysis.

This idea of presenting data in the form of equations for the use of the operating engineer can be carried further than is attempted here and probably for all classes of machinery.

As an example, take the boiler test curves given in Lieut. Commander Osgood's article:

Curve C, page 1229, "Equivalent evaporation lbs. water per gallon oil per hour *vs.* gallons of oil burned per hour," and curve, page 1230, "Factor of Evaporation *vs.* F. W. Temperature."

From Curve C, it may be assumed that for port use the equivalent evaporation per gallon of oil is constant at 120. Combining this amount with the data from curve, page 1230, the equation is derived:

$$E = 93 + .1\,T$$

where E is the actual evaporation per gallon oil burned, and T is the Feed water temperature.

This equation gives the actual amount of water which would have been evaporated had the boiler been in the same state of cleanliness and upkeep, and had been operated under the same conditions and with the same skill as on test.

A further line of development leading from this may be shown using a Sturtevant forced draft blower turbine—equation $W = 9.8\,P$. Assume port service feed temperature 220°, then $E = 93 + 22 = 115$ lbs. water per gal. oil. Then the gallons of oil required to run the blower per hour is

$$G = 9.8\,P/115 \text{ or } .085\,P \text{ (roughly } 1/12\,P).$$

A scale can be made out of this equation showing the fuel consumption of the blower and pasted on the dial of the throttle gauge for the instruction of the fireroom force in economical operation.

Returning to the point (c) mentioned in the second paragraph where lack of understanding of the application of the analysis was given as one reason for the non-universal use of daily analysis. This is perhaps natural when it is considered that the final result of the form as given in the Rules is a percentage scarcely more informing than the per cent obtained by dividing fuel allowance by fuel used.

The daily analysis can and should be carried much farther toward a definite determination of the location of faults. The sample form for a destroyer port analysis attached takes it a few steps along this line. Even the best analysis merely affords the foundation upon which the engineer officer can base his efforts to eliminate causes of inefficiency.

The quantities which are required to be determined for this more complete analysis are

(a) Pounds of water which would have been used had all machinery operated at its test efficiency.

This is determined by adding up all individual consumptions calculated by the equations discussed above.

(b) Pounds of water actually used.

Determined by actual measurement—timing given quantities of water collected in feed tank and from that calculating the total amount used in the day.

(c) Gallons of oil burned.

(d) Pounds of water which should have been evaporated, had boilers operated at test efficiency.

Calculated from oil burned using boiler formula given above.

(e) Pounds of water actually evaporated.

Add make-up feed to pounds of water actually used.

(f) Gallons of oil allowed by Engineering Competition Rules.

From these quantities the following percentages are obtained:

(a) divided by (b) gives the relative efficiency of the steam ends of steam-using machinery compared to their test performances.

(e) divided by (d) gives the relative efficiency of the boilers compared to their test performances.

(b) divided by (e) gives the relative efficiency of the whole plant including boilers and auxiliaries.

(f) divided by (c) gives an "Efficiency of Operation" which, although dependent upon the suitability of the competition allowance, takes into account not only the efficiency (b)/(e) but whether machinery is run too fast, too many auxiliaries are operated, or for too long a time, and such operating features.

The difference between (a) and (e) is a measure of leaks inside the steam systems; through leaky valves, traps, piston rings, drain seals, heating systems, etc., where the water is not lost, just as the make-up feed is a measure of leaks where the water is lost.

With all thse efficiencies worked out the engineer officer's task of locating each cause of lowered efficiency is much simplified, and more so as he has each day an itemized list of test consumptions for each piece of machinery for comparison with other days. The results he obtains are thereafter dependent upon his engineering ability.

The daily analysis has here been worked out for port use only, and the equations for auxiliaries. Both have been used underway, however, involving a few more complications but none that are prohibitive.

It is hoped that the ideas presented in this article will be found of value to the service and by facilitating a wider dissemination of information and reducing the drudgery of analysis contribute to raising the level of Engineering Efficiency.

EQUATIONS DERIVED FROM CURVES IN AUGUST UNITED STATES NAVAL INSTITUTE PROCEEDINGS

(Check Against These Curves to Prove the Validity of the Formula)

Back Pressure in All Cases, 10 Pounds Gauge

Boiler.

$$E = 93 + .1\ T.$$

Main air pump. 15x30x30x24 at 28" vacuum.

$$W = 350 + 90\ S.$$

Auxiliary air and circulating pump. 5½x6x8x7 at 2" vacuum. 15 pounds press.

$$W = 90 + 4.25\ S, \text{ or roughly, } W = 100 + 4\ S.$$

Main feed pump. Blake 16½x24. Disch. press. 500 pounds gauge.

$$W = 500 + 220\ S.$$

Auxiliary feed. Blake 16½x11x18. Disch. press. 300 pounds gauge.

$$W = 400 + 150\ S.$$

F and B pump 7x7x12. Disch. press. 75 pounds gauge.

$$W = 120 + 13\ S.$$

When pumping bilges or when used as flushing pump (DS= 35 to 40 and disch. press. 15 pounds) allow 75 lbs./hr.

F. O. Booster. 6½x7x8. Disch. press. 30 pounds.

$$W = 70 + 4.5\ S.$$

F. O. Service. 6½x4½x12. Disch. press. 150 pounds.

$$W = 80 + 11\ S.$$

Lubricating oil pump. 7x8x12. Disch. press. 40 pounds.

$$W = 100 + 10.5\ S.$$

Oil cooler circulating pump. 8x9x12. Disch. press. 35 pounds.

$$W = 100 + 11\ S.$$

Air compressor Westinghouse.

$$W = 25 \times \text{Pressure.}$$

Fresh water pump. $3\frac{1}{2}$x4x4. Disch. press. 30 pounds.

$$W = 40 + 1.5\ S.$$

Evaporator feed pump. Disch. press. 60 pounds.

$$W = 110 + 5.5\ S.$$

FORMULÆ FROM CURVES FURNISHED BY NEW YORK SHIPBUILDING CO. WITH 16TH DIVISION

Back Pressure 0 Pounds Gauge

Main air pump. Warren 11x32x21. Between 10 and 25 *DS*. 28" vacuum. Add $2\frac{1}{2}\%$ for each 5 pounds back pressure.

$$W = 1800 + 100\ S$$

Main feed pump. 300 pounds discharge pressure. Warren 16x12x24. Add 2% for each 5 pounds back pressure.

$$W = 1000 + 225\ S.$$

Auxiliary feed. 300 pounds disch. press. Warren 15x10x16. Add $2\frac{1}{2}\%$ for each 5 pounds back pressure.

$$W = 800 + 100\ S.$$

Augmenter condenser — throat $\frac{13}{32}$ inch.

$$W = 6.67 + P \text{ where } P = \text{absolute pressure.}$$

Fuel oil service pump. Disch. press. 150 pounds. Warren $6\frac{1}{2}$x$4\frac{1}{2}$x12. Add 4% for each 5 pounds back pressure.

$$W = 70 + 12\ S.$$

Lubricating oil pump. Warren 6 x 8 x 12. Disch. press. 40 pounds. Add $3\frac{3}{4}\%$ for each 5 pounds back pressure.

$$W = 20 + 22\ S.$$

Oil cooler circulating pump. Warren 6x7x8. Disch. press. 35 pounds. Add $5\frac{1}{2}\%$ for each 5 pounds back pressure.

$$W = 0 + 10\ S.$$

F. & B. pump. Warren 7x7x12. Disch. press. 100 pounds. Add 3% for each 5 pounds back pressure.

$$W = 160 + 21\ S.$$

Evaporator feed pump. Warren 4½x6x6. Disch. press. 160 pounds. Add 2¾% for each 5 pounds back pressure.

$$W = 20 + 9\ S.$$

Distiller F. W. pump. Warren 3½x4x4. Disch. press. 30 pounds. Add 6% for each 5 pounds back pressure.

$$W = 20 + 9\ S.$$

Auxiliary air and circulating pump. 6x8x8x7. Water press. 15 pounds. Vacuum 20" *Hg*. Add 5½% for each 5 pounds back pressure.

$$W = 25 + 10\ S.$$

Westinghouse air compressor. Steam pressure 200 pounds.

$W = 3180 + 6\ P$ where P = disch. press.

Generator 25 *KW*. Back pressure 10 pounds gauge.

$$W = 600 + 46\ KW.$$

Note that this is lbs./hr. and that *KW* is not *KWH*.

Fuel oil heater.

$W = .3$ gals. oil/hr.

Forced draft blower. Terry turbine.

$W = 33\ P$ with all hand valves closed.
$W = 41.5\ P$ with one hand valve open.
$W = 50.5\ P$ with two hand valves open.
$W = 59\ P$ with three hand valves open.
$W = 67.5\ P$ with four hand valves open.

Note that these figures are independent of *RPM* back pressure or air pressure so long as throttle pressure (abs) is more than 1.7 back pressure (abs), *i. e.*, about 35 pounds gauge.

The figure for oil consumption by the blower with all hand valves closed is 33 P/115 or .287 P gal./hr.

FORMULÆ FROM TEST DATA, JOURNAL A. S. N. E., AUGUST, 1918.

STURTEVANT TURBINE

P Inlet Pressure Absolute

$W = 9.8\ P$ with all hand valves closed.
$W1 = 14.2\ P$ with one hand valve closed.
$W2 = 18.8\ P$ with two hand valves closed.

FORMULÆ FROM CURVES FROM BU. ENGINEERING (FOR BETHLEHEM DESTROYERS)

Auxiliary Air Pump—Simplex Featherweight, 6x10x8

$W = 90 + 4\ S$. Estimated.

Generator 25 *KW*, G. E. turbine 3600 R. P. M. Steam at 200 pounds, 0° superheat.

On 28" vac.

$W = 300 + 32\ KW$.

On 25" vac.

$W = 320 + 34\ KW$.

On 0 pounds gauge

$W = 410 + 35\ KW$.

On 10 pounds back pressure

$W = 500 + 48\ KW$.

Auxiliary condenser circulating pump 3x3 reciprocating.

$W = 50 + .3\ RPM$. Estimated.

Main air pump. 15x30x30x24. Worthington.

$W = 100 + 100\ S$. Estimated.

Main auxiliary F. & B. pump. 7x7x12. Worthington.

$W = 140 + 15\ S$.

Lubrication oil pump. 7x8x12 V. S. Worthington.

$W = 290 + 7\ S$ Estimated.

Distiller fresh water pump. 3½x4x4 V. S. Worthington.

$W = 20 + 1\ S$. Estimated.

Oil cooler circulation pump. 8x9x12 V. S. Worthington.

$W = 420 + 8\ S$. Estimated.

Main and auxiliary feed pump. 16½x11x16 V. S. Worthington.

$W = 250 + 125\ S$. Estimated.

Evaporator feed pump. 4½x6x6. Worthington.

$W = 5 + 2\ S$. Estimated.

Fuel oil booster pump. 6½x7x8 V. S. Worthington.

$W = 140 + 3\ S$.

Fuel oil service pump. 5½x4x8 V. D. Worthington.

$W = 340 + 19\ S$.

FORM FOR DAILY ANALYSIS AT ANCHOR

(Bethlehem Destroyers)

S—D. S. PER MIN. *P*—INLET PRESS. (ABS). *R*—*RPM*

Unit	Formula (H)	Hrs.	DS or P or R	Lbs./Hrs.	Lbs. total	Remarks
Feed pump M.or A.	500 + 150 *S*	....	....	.....	....	Dis.pr.300 lbs
F. D. Blower.....	10 *P*					
F. & B. pump.....	.....	....	....	75	....	Dis. pr. 15 lbs.
F. & B. pump.....	100 + 13.5 *S*	....	....	.....	....	Dis. pr. 75 lbs.
Service pump	340 + 19 *S*					
Booster pump....	140 + 3 *S*					
Evap. feed pump.	5 + 2 *S*					
Fresh water pump	20 + 1 *S*					
Aux. air pump ...	90 + 4 *S*					
Aux. circ. pump..	50 + 3 *R*					
Lub. oil pump....	100 + 11 *S*. .	....	....	.....	....	Dis. pr. 40 lbs.
Fuel oil heater...	.3 × gal. oil.					
Air comp. West..	25 × press.					
Generator.....	300 + 32 *KW*.	....	....	.....	....	At 28" vac.
Generator.....	410 + 35 *KW*.	....	....	.....	....	At 0 lbs.
Generator.....	500 + 48 *KW*.	....	....	.....	....	At 10 lbs.B.P.
Main air pump...	100 + 100 *S*					
Evaps. S. E.....	15 lbs. per gal.					
Evaps. D E.....	8 lbs. per gal.					
Evaps. Aug. Exh.	0 lbs. per gal.					

(1) Total steam accounted for in 24 hrs.....
Make up feed.....gals.....lbs.
Oil by account.....Gals. Feed water temp.....
Oil to galley.....Gals. (4) Rate evap. (93+.1T)
(2) Oil burned.....Gals. 24 hrs. .....Lbs/gal. oil.
(3) Oil burned/hr.....Gal. (5) Total computed evap.
(11)Oil allowance.....Gal./hr. (4)x(2).....Lbs.
.....Gals. water collected in feed tank in.....minutes.
(6) Actual water used.....Gals./hr.....Lbs./hr.
(7) Actual water used.....Lbs. total per day.
(8) Actual water evaporated....Lbs. total per day (adding make-up feed).
Overall efficiency of plant (1)/(5).....%
Boiler efficiency (8)/(5).....%
Efficiency auxiliaries (1)/(7).....%
Competition ratio for day (11)/(3).....%

CHECKS.

(9) Feed pump piston displacement per hour 7400 *S*.....Lbs.
Water end efficiency (6)/(9).....%
(10)Service pump piston displacement / Hr. 105 S.....Gals.
Oil end efficiency (3)/(10).....%

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FLEET RADIO COMMUNICATION IN WAR

By LIEUTENANT (J. G.) H. D. KENT, U. S. Navy

The battle efficiency of any fleet is vitally dependent upon the state of efficiency of fleet radio communications. This is a fact, not an opening argument. The late World War removed all doubts about the effectiveness of radio as a weapon. To-day we are inclined to measure its scope of usefulness and effectiveness by standards set up five years ago. The battle of Jutland gave us proof of radio communication's effectiveness and dependability and on that day it ceased to be an innovation or experiment. In view of subsequent development, we can now consider the radio equipment and organization of communications possessed by each side in that battle as crude. The real development of radio was brought about after the battle of Jutland. It was as much a development of organization as of material. It is the organization features that I propose to discuss herein.

Boilers will steam even though inefficiently fired; engines will turn over and propel ships even though not attended by expert mechanics. Likewise guns can be fired by untrained crews and an occasional hit scored. Communications cannot be employed in war time unless highly organized. Prior to contact with the enemy our plans would be revealed and during battle our fleet would be confused by inefficient communications.

In these days of immense fleets and central command, it is questionable whether or not these fleets could be coordinated and directed in battle except through the medium of radio communication and, even though it might be possible, it is obvious that an enemy who could utilize radio would place us at a tremendous disadvantage—all other things being equal. It will never be the lack of efficient apparatus which will handicap us on the day

of battle but lack of organization. It will not be the fault of present communication and radio officers if we lack organization but rather lack of foresight and sympathy on the part of officers in high command, afloat and ashore.

To promote cooperation and understanding between high ranking officers, we have a Naval War College. The courses there are designed to correct the individual perspectives to the prevailing doctrines, principles of strategy and tactics. Many of the detached ideas of officers who attend this school may be sounder than those advanced in the course but he subordinates his own views to the ensemble of ideas of the whole because the general assembly of the latter is closer fitting and less conflicting.

In war it remains to the commander-in-chief to originate the strategy to be employed. If his plans are sound, they will contain certain reflections of the war college influence and his subordinates will be able to undertake the details of execution understandingly. The main component of strategy is secrecy. Sooner or later the plans of the highest in command must be entrusted to radio. It cannot be avoided in these days of express speed and "thousand-ship" navies. Unless the organization of communications is extremely efficient, some parts of those plans will be revealed to the enemy and the "prior contact" strategy evaporates. Should this revelation betray our outlines bold and our units unsurprised and ready, all is well. We are building a big navy. If we are not preparing to meet another nation of great sea power, what then are we doing? The people of our country are giving us the weapons. Shall we assume we are only to use them against greatly inferior sea powers? No! Our communications must be organized upon the principle that eventually we will meet an enemy as strong as ourselves. All of which comes back to the fact that we must endeavor to organize for the purpose of handling fleet radio traffic as accurately, expeditiously and secretively as possible.

There is a significant relationship which always exists, to a certain extent, between the plans and movements of a fleet and the radio work carried on between ships of that fleet. The commander-in-chief is dependent to a certain extent upon radio communication for the information upon which he bases his estimate of a situation. After orders are formulated, he must distribute some of them by radio. Later he receives from his scouts information confirming his estimate or requiring readjustment of

plans. His main body may be ordered under way by radio and be maneuvered by radio until physical contact with the enemy is made. At the last minute he may be required to rearrange his line or improvise quickly to compensate for unexpected distribution of strength. Radio offers the most flexible means of doing this. In battle tactical maneuvers can be directed by radio when smoke screens, fog or haze would render signals useless. Fire discipline and fire concentration can be effectively carried out by radio and aeroplane spotting will be essential, using radio to report fall of shot.

To make all this possible, radio material must be installed so that radio communication can be maintained from each ship as long as she is able to stay in the line. Duplication of antennæ is the main requisite. Apparatus can be kept behind maximum thickness of armor.

Assume that the events outlined above are logical and do occur. Is it not obvious that we have confided enough to provide an enemy with a solution of our plans, provided he has intercepted all of the radio traffic of our fleet and can interpret it? Of course he will not be expected to accomplish this easily or quickly but a careful and intelligent study of our work by communication and strategical experts would certainly reveal some parts of our plans which, if correctly interpreted, would advertise the general objective. Even when radio work is most carefully handled, if it is intercepted by the enemy, it will give negative information which would limit his conjectures to a narrower field.

The layman is prone to believe that codes and ciphers, if carefully used, will insure secrecy. Most naval officers are informed to the contrary but most of them place too much confidence in codes and ciphers. Codes and ciphers, no matter how elaborate or intricate, only delay the ultimate receipt of the coded information by the enemy. The fact must be constantly remembered and the consciousness of it will place us on a pinnacle from which a true perspective can be obtained. Only a few moves can be obscured from an alert enemy and therefore the order of succession should never be indicative of the real objective. Sometimes, though, it may be policy to interpolate with "fakes" or to use a program of "fakes," a sort of a "radio feint," so to speak.

The time element or life of a code is an important consideration. No fixed rules can be laid down. Any code or cipher devised by

one human brain can be interpreted eventually by another. If several experts attack the problem scientifically, the solution is hastened. No cipher or code should be given a factor of safety greater that ten days if vital information is being confided to it.

The "breaking" of a code or cipher is much easier if the conditions under which it was sent are known. It is therefore desirable that code and cipher experts be expert operators also. The indications intuitively sensed by a radio operator very seldom can be correctly conveyed to him by another party. Other operators might not perceive significant conditions which would be obvious to the expert.

The above facts do not justify any carelessness or relaxation on the part of officers and men having custody of secret and confidential codes because a diagnosis of traffic has an element of uncertainty, but if we present to the enemy a solution he has hard facts.

More code and cipher organizations are undermined in peace than in war time. During peace there are always a few persons who are careless and compromise codes because they assume disinterestedness on the part of potential enemies. The first few moves of a war may determine the outcome. If our codes are compromised at the start, it is terrible indeed. Even though new codes are substituted the evil cannot be thus remedied. The "en clair" side of a code book is as important as the code. The order of appearance of the "en clair" side will be unique and characteristic of our nation. If the enemy possesses this alone, his difficulties are greatly reduced. For this reason too great care cannot be observed in the destruction of obsolete code books.

In peace time when a potential enemy or even a friendly nation comes into possession of our codes through the diagnosis of intercepted traffic, the damage may not be in the information contained by those messages, but in the fact that he can decipher previous messages which might be very embarrassing. Regardless of the nature of the information contained in a coded message, indifferent or careless coding is most culpable. Even though we could devise an infallible code which the enemy could not break, we could not be indifferent in using it or in handling traffic.

Variation in fleet radio traffic is most significant also. Sudden increase in traffic is invariably an indication of coming fleet activity and therefore fluctuations must be avoided. This can be

done by careful use of "dummy" messages, which are coded from a "dummy" code book but are devoid of meaning—in other words a "blank." However, such messages appear to be bona fide to the enemy. "Dummy codes" should be prepared in three, four, five and six-letter combinations. A definite system of releasing them should be used and the amount of traffic controlled by the flagship. Regular curves of daily traffic of the fleet must be kept and the valleys filled in with "dummies." The average hourly traffic should be kept up to the maximum demand point reached during activities of the fleet.

In addition to serving the above purpose, dummies play havoc with the enemy's code experts because the meaningless jargon can never be interpreted. These experts are bound to include many dummy groups in their respective group classifications. This inclusion makes the application of mathematics in "average reoccurrences" difficult. Also the handling of dummy messages is excellent training for operators as they become accustomed to handling peak traffic continuously and consistently. When "dummies" are used, operators must be required to handle them with as great care as is exercised in real messages.

We should always consider communications from a psychological standpoint. Anything we can do to break down the morale of the enemy's code experts should be carried out. They should be misled as often as possible by special programs. We must always assume that the enemy's commander-in-chief will not possess unlimited confidence in his code experts and communication officers. If they supply him with unreliable information he may be openly skeptical of them. This should be our object. Likewise, our own commanders must expect similar programs by the enemy. Imaginary movements are easily manufactured and staged through clever manipulation of radio sets.

The radio compass has become remarkably reliable ashore in the past two years. We hope for greater accuracy on board ships soon. The radio compass aboard ship is now dependable for relative bearings of a general nature and would often betray simple "fakes" as mentioned above. The writer understands that the Zeebrugge affair was made possible by radio compasses, which were extensively used in plotting the enemy's channels through mine fields by averaging up bearings observed upon testing

submarines as they passed in and out. Radio compasses are at least 25 per cent more accurate now than in 1917, so we must consider the possibility of their employment for similar purposes in future wars.

Radio compasses in aircraft enable them to steer the shortest course to a ship at sea using radio. This fact complicates the scouting problem and makes concealment practically impossible, either of position or of strength.

It would appear from the foregoing that the use of radio at all is unwise but such is not the case. Communication experts and radio operators will never be 100 per cent efficient and not all opportunities offered will be availed of. Commanders-in-chief and other commanders for many years will be reluctant when it comes to relying wholly upon deductions from intercepted enemy traffic. If the communication system of the enemy could be made 100 per cent efficient, strategy would be almost eliminated and all we could do would be to give battle at the most favorable point, provided he was willing to meet us there. But 100 per cent efficiency will never be obtained in radio any more than in ordnance and gunnery, so then our success in naval warfare must depend to a large extent upon difference in relative efficiency. We must assume that our potential enemy will be naturally endowed with cunning and stealth and prepare to play his own game. This requires training along special lines of the best fitted minds.

We should have a lasting communication organization afloat which will be independent of changes in fleet command. This organization requires an original definition of policies which should be governed by the principles laid down at the War College. Communications, strategy and tactics are inseparable.

Until we have properly trained communication officers we can not properly organize fleet communications. The present-day communication officers are too often accidental rather than designed. There are more communication officers in name than in fact. There are too many different kinds of organizations aboard ship, whereas every ship should be organized along the same lines. Each communication officer organizes his force according to his own ideas, but, granting that 75 per cent of the ships are excellently organized, cooperation to the fullest extent is handicapped. These facts are too well known to have these statements construed as critical.

We need a communication college and it should be closely allied with the War College, if not directly under it. There should be initial courses and post graduate courses. The initial courses should be given to officers of suitable temperament and experience. These courses should prepare radio and signal officers. After actual service in both branches, those officers who have been satisfactory should return for a post graduate course in communications and radio strategy. If an officer demonstrates unusual ability in communication work, he should be encouraged to remain in this work. Many communication officers are disheartened because of the fact that long tours of communication duty are jeopardizing their careers. Some arrangement should be made to allow the most skilful and sagacious communication officers to take an advanced course in radio strategy, code and cipher work and languages with the idea of fitting them for division and force radio officers. The logical communication career of an officer would be as follows:

Midshipman	Naval Academy four years.
Ensign	Routine duties afloat three years—engineering and line.
Lieutenant (j. g.)	Eight months Communication College. Radio and Signals. Six months Signal Officer Afloat. Twelve months Radio Officer Afloat. Six months Communication College—post graduate course.
Lieutenant	Communication Officer, battleship two years and then if unusually efficient to Communication College for post graduate advanced course, if desired. If not the above, then return to watch and division duties. If above the average and due for shore duty, then to duty with D. N. C. or Asst. D. S. C.
Lieutenant commander	If due for sea and has finished advanced post graduate course, to duty as division communication officer, two years. If due for shore duty and has finished post graduate course, to duty as D. C. S. or with D. N. C. District Radio Material Officer.

Commander	Take regular War College course. To duty at sea as Force Communication Officer. To duty ashore—Coast Communication Supt. or Assistant to D. N. C. Bureau of Engineering (Radio).
Captain	Fleet Communication Officer. Assistant to Director Naval Communications.
Rear admiral	Director Naval Communications.

The program above depends upon the constant elimination of the unfit and unwilling. Regardless of the period spent in communication work no officer would be handicapped in his preparation for command. As a matter of fact the British consider that communication experience is the best kind of preparation for ultimate command.

A communication staff corps is advocated by many but such a corps has many drawbacks. Communication work cannot be handled intelligently until an officer is well acquainted with line duties, fleet organization, strategy and tactics. The formation of a staff corps would tend to isolate the members from the service as a whole. It would also necessarily include many of the present line officers who might not prove to be qualified temperamentally. Subsequent vacancies would have to be filled with civilians or from the ranks. After the nucleus were well up, the lower grades would certainly be filled with officers lacking versatility in general naval work. Many advocates of the staff corps point out that the Army Signal Corps has been a success. The signal corps does little but receive and deliver despatches and maintain the channels. The communication service of the navy is charged with the execution of liaison between departments, which requires a broad knowledge of the service as a whole. The communication officer must always keep his perspective enlarged and correct and be sensitive to the tendencies and trend of policy changes.

We also need an intelligence system reorganization which will keep communication officers informed concerning foreign communication activities, especially those of potential enemies. I doubt if one communication officer in fifty knows of a single unique feature of the Japanese communication system. As early as 1917 the Japanese Government was educating some of their best communication officers in American colleges. I have in mind a lieu-

tenant commander in particular who was sent to Harvard to study under Professor Pierce at Craft Laboratory. He carried back to Japan with him a very good education in radio engineering and an intimate knowledge of our communication service as well. He studied the personnel of the radio school at close range. He "listened in" upon current official radio traffic and usually gleaned some information from each of his conversations with the most astute. He saw us in action in war time. I venture to say that Lieutenant Commander Nichizaki could instruct many of our own communication officers to-day about their own system. If the Japanese have utilized this officer with their customary thoroughness, he has already instructed their whole service along these lines before now. Other Japanese officers are undoubtedly under instruction in the United States of America now. If there should be war with any strong naval power to-morrow, could those of us now on communication duty be reasonably expected to hold our own against a service so well prepared and carefully trained? Our Yankee ingenuity avails but little. Isolated cases of ingenuity are never effective and more likely to confuse our own forces than the enemy.

I have brought out many facts—some of which are not pleasant to consider. It is only fair to state unreservedly that the present heads of the communication service are above any criticism I have raised here. All of these heads are line officers of broad experience, who have been fitted for their present duties by an unusually large amount of service in communication work or its allied branches. These men have demonstrated unusual ability to organize but to get lasting results they must be supplied with enthusiastic officer material to organize upon. The present heads of the communication service deserve great credit for their accomplishment in holding communications to war-time efficiency. It has been a great task to do even that. I believe we have made progress in the last two years towards better preparation for war.

To stimulate greater progress it is essential that all higher ranking officers be fully convinced of the true importance of radio communications. They must also recognize the value of communication duty from an educational standpoint in the preparation of officers for ultimate command. If the officers eligible to serve upon selection boards will give proper credit for communication duty, it will become more desirable duty and attract some of the

most brilliant minds. If brilliant minds, enthusiastic to improve conditions, are enlisted in the course, we can leave to present leaders the work of reorganization.

The present organization has been adjusted to utilize the present type of communication officer—usually one lacking experience and performing many extra duties.

The reorganization must be built upon properly trained versatile communication officers, who are enthusiastic and contented because they are confident that their accomplishments in communications will receive the same weight as those of other officers other lines.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

VENUS AS A DAY SIGHT

By Lieutenant R. B. Carney, U. S. Navy

The problem of accurately determining the ship's position during the day is one that presents many difficulties and varying errors. For the most part, it seldom occurs that proper cross-bearings can be obtained and the navigator is obliged to fall back on that rather uncertain quantity, the run to local apparent noon. On ships whose missions permit of steady steaming on an uninterrupted course, the calculation of the correct interval to noon presents few real difficulties and no real disadvantages, but there are many times in the course of naval work where it is wellnigh impossible to properly run the ante-meridian sight up to local apparent noon with any degree of certainty. The navigator cannot be considered in the matter of maneuvers, and this very question of maneuvers gives rise to an error that varies in amount with the character of the evolutions performed, and with the nature of the ship performing them.

Particularly in latitudes where the range of solar azimuths is small, that is to say where at no time is the sun near the prime vertical, the greatest accuracy is necessary in order that a good noon fix can be secured; this is evident from a consideration of the intersection of lines inclined at a small angle, and it is also evident that a small mistake in the matter of the ante-meridian line will result in a magnified error when the line is run up to local apparent noon. This accuracy of advancing the line is a hopeless task where there are numerous changes of course such as are encountered in destroyers or other craft engaged in screen, scout, maneuvering, or attack work, and it was this contingency that led the writer to consider the feasibility of using Venus in conjunction with the sun during daylight hours, as a method of

determining position without reference to a sun sight previously taken and run up.

Venus is generally visible to the naked eye some time before sunset as the evening star, and this very fact seemed to indicate that it was only a matter of locating the planet at any time during the day in order to make use of it. This use of Venus is by no means original with the writer; it has been used for years by older navigators, but its general use does not seem to be known among junior members of the craft and it is for their information that this paper has been prepared.

The problem, then, is the location of Venus during daylight hours when it is not discernible to the naked eye, and its solution is so simple as to make it practical, quick, and accurate. It becomes purely a matter of working backward with the star identification tables. Let us first consider the general method involved before taking up a concrete example.

A glance at the chronometer will give an approximate idea of the G. M. T. Apply the data from page two of the Nautical Almanac to obtain the G. S. T. and to this apply the D. R. longitude to determine the L. S. T. From the ephemeris of Venus take out the right ascension and declination roughly, applying the R. A. to the local sidereal time to determine the hour angle. The hour angle and declination, together with the D. R. latitude, are now known—the necessary arguments for entering the star identification tables.

Turning to the identification table with the latitude nearest to that of the D. R. position, find by inspection that part of the table where the tabulated hour angle and declination correspond to those predetermined for Venus; pick out the azimuth and altitude corresponding to these arguments, having due regard to the direction in which the tabulated azimuth must be applied, and also to the fact that should the declination be marked minus (−) it is to be named opposite to the name of the latitude. It is unnecessary to interpolate more closely than is possible by inspection.

With this altitude and azimuth set the sextant and pelorus accordingly. Owing to the fact that these calculations are all made by inspection and are not exactly accurate it has been found advisable for purposes of practical work to use the solar telescope attached to the sextant. This telescope facilitates the location of the star by virtue of its magnification but at the same time offers little hindrance owing to its relatively lage field. Venus, although

invisible to the naked eye, shows up surprisingly plain when viewed through the solar telescope in this manner.

The steps enumerated sound rather complicated on the face of it, but in actual practice it is not more than a matter of two or three minutes' work to obtain the necessary information to properly set the sextant and pelorus. An example will serve to illustrate the method more fully.

On February 8, 1921, in about latitude 21 30 00 South, longitude 76 30 00 West, destroyer maneuvers in conjunction with the battle fleet made it impossible to accurately run up the ante-meridian line to local apparent noon. The latitude was easily determined by catching the sun on the dip, but the longitude could not be set down with any degree of certainty. So at about 12.55 p. m., the chronometer was seen to read 6.02; allowing five minutes for working out the data, and knowing that the C. C. was 2 m. 24 s., it was evident that five minutes hence the G. M. T. would be roughly 6 04 36. Applying the correction for G. M. T found on page two (2) Nautical Almanac, the G. S. T. was found to be 3 17 47.6. Subtracting the longitude (5h. 06m. 00s. West) gave the L. S. T. By inspection the R. A. of Venus was seen to be about 0h. 21m. The hour angle was therefore 22 11 47 and the declination was roughly taken as 3 25 00 *North.*

Chro. (allowing five minutes)	6 07 00
C. C.	(−)2 24
G. M. T.	6 04 36
	21 12 11.8
	59.8
G. S. T.	3 17 47.6
Long. (D. R.)	5 06 00
L. S. T.	22 11 47.6
R. A. (Approx.)	21 00
H. A. Venus	21 50 47.6
or	2 09 12.4 East

Dec. Venus 3 25 00 *North*

Entering the star identification tables, it was seen that the above hour angle and declination were closely approximated in juxtaposition where the altitude was 52 00 00 and the azimuth South 128 East or 52 True. The sextant and pelorus were set accordingly and Venus was at once picked up near the horizon

close to the calculated bearings. The actual altitude and azimuth were found to be 50 31 00 and 50 00 00 respectively when the sight was taken.

The ease with which Venus may be located in this manner is surprising and the advantage of its use in connection with the sun is self-evident. Numerous methods of application of Venus as a day sight will suggest themselves to the navigator. For example, the altitude may be predicted for local apparent noon and a cross obtained, the meridian transit of Venus may be predetermined and simultaneously taken with the sun. In point of fact only the roughest assumptions need be made in regard to the selected G. M. T.; if the H. A. is worked to minutes by inspection no difficulty is experienced in locating the planet.

Jupiter offers almost the same advantages at certain times, depending upon its determining coordinates, and the writer has even at times been able to make use of Sirius before sunset, although in the case of the latter more exact calculations are necessary.

The use of Venus and Jupiter, however, is commended to all navigators as a most simple and efficient method of eliminating the uncertainty entering into all calculations that necessitate the advancing of one line to another through a period that may cover hours of steaming through unknown currents or doubtful errors due to service conditions.

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SPECIALIZATION *VERSUS* AMALGAMATION

By LIEUT. COMMANDER S. J. ZEIGLER, JR. (C. C.), U. S. Navy

From time to time articles appear in our service papers advocating amalgamation of certain staff corps with the navy line. More elaborate essays appear in our professional publications. Occasionally recommendations on the subject find their way to committees of Congress. The alleged advantages of amalgamation vary from monetary saving by the omission of staff initials following officers' names in official correspondence, to improvement in warship design, and even to changes in human nature which will eradicate differences of opinion.

"Amalgamation," a recent article in the U. S. NAVAL INSTITUTE PROCEEDINGS, by Commander N. H. Goss, U. S. Navy, discusses the amalgamation of the Construction Corps. Although many of the arguments for the maintenance of one group of specialists, or staff corps, apply with equal force to other staff corps as well, this discussion will be restricted to the Construction Corps.

That a "Navy *versus* Construction Corps problem" exists at all, or even that a Line *versus* Construction Corps problem exists is seriously doubted. If such a problem does exist in the minds of any line officers, and is allowed to continue and increase, it may lead to failure of cooperation and loss of efficiency. However, the real problem which constantly engages the attention of the naval constructors is rather the one of *the Construction Corps for the Navy*. The Construction Corps is an integral part of the navy. Its only reason for existence is for service to the Navy. It has no independent measure of success; its sole index of efficiency is the degree of success or failure of the fleet, which the Construction Corps' function is to design, construct and maintain. This

fleet, the performance of which gauges the merit of the Construction Corps, is operated by the Navy Line. What reason could there be for any other attitude on the part of the Construction Corps than one of energetic, whole-hearted, cooperative support of the Navy Line? There are other influences toward cooperation such as warm personal comradeships engendered between present line and construction officers by five or six years daily association in the Naval Academy and in steerage messes, at the age most conducive to lifelong friendships. This initial association is a powerful influence for cooperation, and is augmented by the mutual respect resulting from later duty in which line officers and constructors find themselves on the same stations engaged upon closely associated work towards a common result.

It is but natural that from the source, training, and life-work of naval constructors they constitute a loyal element of the naval service. They are an intelligent, hardworking, and efficient group of naval officers, who give their lives in service without any hope of ever reaping the ultimate reward always possible to their classmates who remain in the line, the opportunity successfully to meet an enemy in battle.

Prima facie proof of the esteem with which the parent Line of the navy regards its offspring, the Construction Corps, lies in the fact that it is possible, year after year, for the Construction Corps to recruit from the Navy Line officers drawn from the best material which each Naval Academy class has to offer, young officers, energetic, ambitious, patriotic and eager to serve their country to the best advantage.

Naval constructors do not claim to be able to manage destroyers, battleships or fleets better than the line officers in command. Yet we constantly hear, though possibly not seriously advanced, the converse, that line officers could design ships and manage navy yards better than naval constructors. However, at the present state of human development, an engineering project of the magnitude of our navy could not successfully be operated by a managerial personnel composed of a homogeneous type of jack-of-all-trades, any more than could a present-day fleet be successful if composed of a homogeneous squadron of vessels. The modern era is one of the specialist. Just as a modern fleet requires distinctly different types of vessels, a large engineering organization such as the navy requires different special types of personnel.

The trained and experienced surgeon, supply officer, engineer, and constructor, in addition to the executive line officer, who, by the way, is only another type of specialist, are just as necessary to the successful creation, maintenance and operation of a modern navy as is the inclusion of battle cruisers, scouts, destroyers, submarines and aircraft carriers, in addition to battleships, in the material composition of the fleet. There is no more reason to an argument that a homogeneous officer personnel is superior to one made up of well balanced groups of specialists than there would be to an argument for a fleet composed entirely of dreadnoughts, or for a turret crew composed entirely of gun-pointers.

The modern organization of navy personnel with its separate corps of specialists is the outgrowth of evolution extending over the entire period of naval warfare, just as modern fleet composition is the epitome of warship design derived through the slow evolution of type with its progressive branchings into separate diverging types, and embodying the accumulated wisdom of the ages since the days of the homogeneous fleets of Egyptian galleys.

The American Navy is probably the most complex engineering organization in this country. Industrially it is of the same order of magnitude as the United States Steel Corporation. Its property investment exceeds that of the Pennsylvania Railroad. Although the mission of the navy is that of national insurance, while that of a private corporation is to earn dividends for its stockholders, the principles of good management are the same for the navy as for any manufacturing or transportation concern. It is not difficult to imagine how the directors of the General Electric Company would receive the suggestion that their staffs of specialists be scrapped, and that instead the entire work of the company, including research, design, promoting, contracts, accounting, etc., be carried on by all round factory superintendents with a practical "shop point of view." Let us picture such an experiment having been tried out on the General Electric Company a few years ago. The results not only would possibly have been that we would still be without electric drive for battleships, but certainly that the company would now be in the hands of receivers, or finally liquidated.

One of the arguments often advanced in discussions of amalgamation is that transferring a staff corps to the navy line would

not deprive the navy of the special services now rendered by the staff corps, since the same officers after amalgamation would continue to be specialists; additional young officers of the line as required would be given special training, and assigned duty at intervals similar to that formerly performed by the corps, and thus the value of the specialist would not only be retained but also increased, because the young line specialist would have a "seagoing point of view." Is this argument sound? We would like to believe that it is, but we are afraid that it is not.

For a few years after the amalgamation of a staff corps, before the group of individuals amalgamated began to be seriously depleted, the function of the late staff corps would very probably continue to be discharged efficiently. Indeed we have a precedent for this in the amalgamation of the old Engineer Corps. However, without protection from possible discrimination against specialists in promotion, which can be afforded only by separate staff corps, the young officer is dubious about branding himself as a specialist. Such possible discrimination may never occur, but with promotion by selection either in its present or in a modified form practically a necessity, there is always a possibility that the policy of some selection board may be to promote the all-round executive officer at the expense of the specialist. This factor is psychological only, but it is possible that it is already at work, and that it is causing promising young engineer recruit material to shy from post-graduate engineering courses, and from engineering duty in general. It is also within the bounds of possibility that in time it may be necessary to reestablish an engineering corps, in order to supply a sufficient number of engineer officers for the navy.

To return to the Construction Corps, assume it amalgamated, and further assume that it proves possible to obtain a sufficient number of young line officer recruits at the time when replacement of the original specialists becomes necessary, will the proposed part-time specialist be able to deliver the goods up to the present construction corps standard?

The average age at graduation from Annapolis is about twenty-two years. After two years at sea, at the age of twenty-four the candidate for specialization in naval architecture, warship design and industrial management undertakes his three-year post-graduate course. He graduates at the age of twenty-seven. Up to this point he is just the same as any young constructor now

graduating from the Massachusetts Institute of Technology, and he is surely just as anxious to dig in and try out his specialty as any young assistant constructor to-day. Leaving the doors of the post-graduate Alma Mater, however, the courses of the full-time and the part-time constructors diverge.

The line officer who undertakes naval construction as an avocation, upon completion of his three-year course, is already a year overdue to go to sea, and he soon finds himself busily engaged upon a three-year tour of watch standing, at which occupation he is at a distinct disadvantage, for his classmates are way ahead of him in the eyes of the captain, executive and heads of departments. Possibly humiliated and discouraged, but not a quitter, by three years hard work he gains most of what he has lost as a seaman. When his sea duty is over, the part-time constructor, now thirty years old, is ordered to a navy yard or to a superintending constructor's office where he can begin to learn something practical about his specialty. His outlook is indeed gloomy. His post-graduate work has all to be reviewed, because three years hard work at sea has left little time to keep up on a non-applied science. Also since his stay is probably limited to two years he must get busy and learn the practical end of the game.

Work as hard as he can, our part-time constructor encounters heavy weather both ashore and afloat, because it is exceedingly difficult for any one man whether he is dubbed line officer or staff officer to become proficient in two whole-time, man-sized jobs. By the time he is fifty our line-constructor has managed to get in perhaps ten years on his specialty, and is competent successfully to swing a navy-yard job, but he is past the zenith of his career. After this he feels comfortable ashore, but in getting a hold on the beach he has lost his grip at sea. Soon he is out of the running for important commands afloat and puts in the rest of his years until sixty-four as an industrial executive at a navy yard. He finally goes on the retired list with the feeling that he has spoiled a good line officer to make a mediocre naval constructor; of course he is right.

The only excuse for this continual shuttling between sea and shore, which prevented the full development of either marked specialized ability or general military leadership, was to give the intended specialist a "seagoing point of view." The mistake was not in providing him with an opportunity for practical experience

and observation, which is a leaven necessary in order to produce the most effective technicians. The error was in devoting too much time, more than required, to general service, and not enough for sufficient periods of concentration on the specialty.

A fact often overlooked is that naval constructors do go to sea, and that the present Construction Corps, in addition to a corps or rather a technical point of view, has a thoroughly practical seagoing background. This is the result of early sea experience as midshipmen or ensigns in the line, augmented by later intermittent details afloat as fleet and force naval constructors, tours of duty on repair ships, regular service on the Board of Inspection and Survey, and temporary details to duty on trials. Naval constructors are regularly detailed on the staffs of the commanders-in-chief of the Atlantic fleet, and of the Pacific fleet. Officers of the Construction Corps are also provided in repair ships' complements. During the World War constructors served on the staffs of the Commander of the U. S. Naval Forces Operating in European Waters, and of the Commander of the U. S. Naval Forces in France. From a consideration of these facts and of the conditions surrounding navy yard duty where constructors deal daily with ships' officers, it is difficult to conceive how the Construction Corps could escape the essential salty atmosphere.

Another, and more tenable, solution for amalgamation admits that an all-line personnel could not render special service up to present standard requirements, but proposes that the number of specialists be reduced, and the vacated billets be filled by civilians. As a makeshift arrangement, this scheme would suffice. But why substitute plain-clothed experts, at much greater expense, for the present uniformed experts? In the first place, are they available, and would they give better service in proportion to their greater remuneration? Industrial executives, good ones, undoubtedly can be secured, if their price be paid, but the necessary salaries would hardly be forthcoming. The salary limits which could be obtained would very probably be little if any in excess of salaries paid civilians and officers in the naval service to-day. These salaries would not attract competent industrial executives in the open market.

Warship designers, however, are not available at any price, or under any conditions; there is no source of supply. Naval architects, competent successfully to design any merchant craft, are

available on the staffs of any of our large shipbuilding firms, but they cannot replace our warship designers. General warship design requires such an enormous outlay of money for the maintenance of the necessary personnel, for intelligence work, research, and experiments, as well as for the maintenance of archives and experimental stations, in addition to design production, that no private corporation could undertake it. The demand for warship construction is entirely too meagre and intermittent to warrant the expense. Warship designers must be developed and maintained within the Navy itself.

The conditions surrounding general warcraft design and the design of component elements of warcraft are not the same, and analogy cannot be drawn between the development of the whole and its parts. The purely commercial fields for boilers, turbines, electrical machinery and gasoline and oil engines are so great, and commercial competition is so keen, that private manufacturers are leaders in improvement in mechanical and electrical engineering design and practice. While private industry has very materially aided the Navy in working out designs for boilers, turbines, reduction gears, electrical machinery generally including electric drive, and aircraft and submarine motors, the Navy has played a lone hand in general design ever since there has been a real Construction Corps. Naval constructors designed and constructed the first experimental model basin and wind tunnels in this country, and naval constructors conducted all of the original experimentation at these plants, literally blazing the way for this work in America. It is in the span of less than a lifetime that the work of the Construction Corps has been accomplished. Many of the officers who founded the science of warcraft design in this country after study in France, England, and Scotland, are still on active duty in the navy to-day.

Granting that civilian substitutes for navy yard commandants, managers and superintendents, if sufficiently high salaries are made available, can be obtained, would their service be as good as that now rendered by commissioned officers? To say the least, it would be a doubtful experiment. The management of civilian navy yard labor on ships controlled by naval personnel and on shore under semi-military conditions is an extremely delicate task, and it is difficult to conceive a successful manager who is not a master of both naval and labor psychology, and well versed in probable

Washington reactions. Who is more apt to have these triple talents, a naval officer of long experience in navy yard management, or an imported civilian industrial executive?

Until quite recently American naval constructors were all civilian experts employed in navy yards just as civilian foremen are now, except that their employment was usually intermittent. When a navy yard received an order to build a ship a "naval constructor" was employed to supervise the construction. When the vessel was completed, if another ship was not to be built, the naval constructor was discharged along with the foremen and mechanics. The civilian naval constructors who built our wooden navies were practical shipbuilders with a certain knowledge of ship design, but were not warship designers, nor were they administrators of any high degree.

The first naval constructor was commissioned an officer in the navy as late as 1866, the appointee being a civilian, and it was not until 1879 when young Naval Academy graduates were selected to recruit the corps, and sent abroad for special study, that the corps of naval constructors as it exists to-day was commenced. It is worth while to remember that the creation by Congress of a "Bureau of Construction, Equipment and Repair," and the formation of a corps of naval constructors as commissioned officers of the navy, were very largely brought about as a result of agitation by line officers of the navy who realized that the highly important functions of construction, equipment, and repair could not successfully be continued by line officers. The present Construction Corps was thus born of necessity, conceived by the Navy Line itself, of which it is a direct offspring.

Unqualified statements encountered both in print and in ward-room discussions to the effect that when ships come to navy yards, it requires greater effort to get hull work through than machinery work, are capable of ambiguous inference. Did such a condition exist, one explanation might be that the machinery division requests are not properly scrutinized, and the work not properly supervised. As none of us believe this we must search for another reason. Can it be due to the incompetence of the hull division officers? Even if the hull division officers were incompentent, would this be a reason for regrettable delay in accomplishment of construction work? Hardly. All ship work which can be undertaken at a navy

yard without reference to the Navy Department is authorized by one individual, the general manager of the industrial department, whether this individual be commandant or industrial manager, and this general manager has identical authority in regard to all repairs regardless of bureau cognizance. Why should this individual be more prompt to authorize one bureau's work than another's?

Is this delay, then, due to paper work, upon which it is almost standard practice to blame many of the Navy's ills? In some yards, possibly, yes. But who of us familiar with navy yard operation would believe that any yard division ever failed to spend its entire allotment of funds on account of delayed paper work? I believe that I am correctly informed that in three only of the nine principal navy yards are there separate central offices maintained by the hull and machinery divisions. The other six yards have combined central offices, and work for all bureaus is handled by one standard production system for the yard. The paper work is identical, and is accomplished by the same individual planners and clerks for both industrial divisions. Further, at three of these six yards dual superintendence is abolished, so that each unit of the yard organization is in charge of one responsible superintendent. One superintendent's function is identical for each bureau's work. In these yards the sheer difficulty of delaying any one bureau's work would soon tire any obstructionist.

Is the delay then encountered in the execution of the work in the shops and on the ships? As every yard's working force is adjusted to the combined monthly allotments of funds from all bureaus, and as one bureau's funds cannot be diverted to another's work, it necessarily follows that aproximately constant forces are employed daily upon work chargeable to each bureau's allotment. It is needless to add that all allotments are fully obligated each month.

It is true that there are many more requests for construction and repair alterations submitted than there are for engineering and ordnance alterations. All of these alterations have to be submitted to the bureaus with estimates, for approval, and the actual work cannot be started by the yard until the proper authority is obtained. This procedure is required by navy regulations and affects all alterations alike. Delay in approval on hull alterations is the same in *degree* as on machinery alterations, the *number* of

items delayed only is greater. How, then, does this construction and repair work become so vexatiously delayed? I leave the answer to a trained psychologist.

To amalgamate the Construction Corps with the line would have little effect upon the material welfare of the present individual naval constructors. Any amalgamation law would at least be fair to the individuals affected, and it is quite within the bounds of possibility that such an act, if passed, would be advantageous to certain individuals, allowing them to retire with higher rank than they normally would attain. Such proved to be the case in the amalgamation of the Engineer Corps, many of the old engineer officers retiring with the rank of rear admiral. Amalgamation would, however, mean the retrogression of the science of which the Construction Corps is the body and the soul. Without an adequate group of specialists to devote their lives, full time, to the science of warcraft design, this vital element of naval defence would in time entirely be lost.

As long as we are human there are bound to be differences of opinion between staff officers and our classmates in the line, just as at present there are differences of opinion among groups and individuals within the line, and just as there are different opinions among naval constructors. However, these differences of opinion nearly always remain friendly, and should never be allowed to interfere with either efficient team work for the Navy, or high regard for the accomplishment of brother officers. The staff officers of the Navy surely join the country in doing honor to the navy's heroes in the line. What staff officer during the World War would not have gladly exchanged his overalls for a suit of wind-proofs? Our only compensation was the thought that the humble navy yard or bureau job was necessary, and that somebody had to do it in order to produce and keep operating a fleet in which more fortunate officers could win the war. In return for the homage which we pay the line, our respect for it, and our service to it, we merely ask, instead of criticism, the Navy's usual reward for good work faithfully performed, an occasional hoist of "WELL DONE."

DISCUSSION

The High Sea Fleet at Jutland

See Page 1721, Whole No. 213

Lieut. Commander H. H. Frost, U. S. Navy.—After the publication in the Proceedings of the paper entitled "A Description of the Battle of Jutland," the writer sent a copy of it to Admiral Jellicoe and three copies to the British Admiralty through the British Naval Attache in Washington, with a request that any errors be corrected.

Admiral Jellicoe in a very courteous letter declined to comment on the paper in view of the fact that the Admiralty was about to publish its official account.

The British Naval Attache later stated that the Admiralty had received the copies and very kindly furnished the writer with a copy of the official report which was recently issued by the Admiralty.

Upon the publication of the paper entitled "The High Sea Fleet at Jutland," copies were forwarded to Admiral Scheer, Admiral Hipper and Commander von Hase, author of that excellent book on the battle, "The Two White Nations." A request was made that any errors might be corrected and any comment considered pertinent might be made.

The following letter was received from Admiral Scheer:

"Weimar, 9.2. 1921.

"Dear Sir.—I thank you very much for sending me your article, which I have read with great interest.

"The description is throughout correct and quite impartial and fair.

"If I may take the liberty of making a comment I would say this: While the battle is progressing a leader cannot obtain a really clear picture, especially at long ranges. He acts and feels according to his impressions. In looking at the diagrams which are made subsequently it would seem as if we must have regarded our position as critical. In reality this was not the case. We were under the impression of the splendid effectiveness of our gunfire and of the fact that the entire battle line remained most conveniently arranged both while under fire and during the regrouping for the night march.

"Thus we were looking forward with confidence to a new engagement.

"The fact that on August 19 the German Fleet again proceeded in a direction which would have placed us in an even more difficult position may serve as proof of this.

"I would be greatly interested in hearing the criticism which is made by American Naval Officers concerning the behavior of the two fleets.

"With the expression of my highest esteem,

"I am, yours very sincerely,

"Scheer,

"Admiral."

The letter received from Admiral Hipper contains very interesting information, presented here for the first time. The letter follows:

"1 III 21

"DEAR SIR.—Please accept my most sincere thanks for your courtesy in sending me your article: "The High Sea Fleet at Jutland," for which I am greatly obliged.

"I have read the article with much interest and thoroughly appreciate its thoroughness and inherent worth.

"If I might draw your attention to a few not very essential inaccuracies they would be as follows:

"Page 1727. Strength comparison. The Germans had only 65 torpedo boats in the battle.

"Page 1729. The small cruisers of the IV Scouting Group were not sent forward on a scouting line for the fleet, but were placed with the squadrons; they were therefore with the main body while the II Scouting Group was in the van with the battle cruisers.

"Page 1742. The movement was carried out *only* for the purpose of avoiding the enemy torpedoes.

"Page 1758. The smoke was not that of the burning *Lutzow*, but a smoke screen purposely thrown out by that vessel and the accompanying torpedo boats.

"Page 1761. Typographical error. 56° instead of 36°.

"Page 1762. The smallest distance between Scheer and Jellicoe during the night was not three but at least 7 or 8 nautical miles. The course of the German Fleet during the night was 136°.

"Page 1763. The *Moltke* and the *Seydlitz* had, during the night, gone to the head of the main body in order to support the II Scouting Group. The *Moltke* sighted a heavy enemy squadron twice during the night (probably the Battle Squadron which remained behind with the *Marlborough*) and was for a time forced southwards, but at daylight she succeeded in joining the main body of the German forces.

"Page 1765. The rumor of the torpedoing of vessels of the *Konig* class was *not* occasioned by the torpedoing of the *Grosse Kurfurst* and the *Kronprinz* which occurred later, in November, 1916, but resulted from the English reports about the battle. Compare Jellicoe, "The Grand Fleet," page 381, where in fact four ships are mentioned *besides* the *Pommern*.

"If you have another copy of your article to spare, the Naval Archives of Berlin would be exceedingly grateful for it.

"I have the honor to be

"Yours respectfully

"HIPPER,

"Admiral."

The correctness of Admiral Hipper's statement that the Grand and High Sea Fleets were at least 7 miles apart during the night is verified by a fresh estimate of the situation as shown by the recent official dispatches, which shows the minimum distance to have been about 7½ miles.

The fact that the *Moltke* was in contact with a British Battle Squadron during the night is proved by Official British Despatches.

"About 12.30, what was first taken for destroyers approaching was observed and 6-in. guns turned on them and the order had been given to open fire, when it was seen that the object was a large ship. She was challenged and made the reply "PL" and rapidly disappeared astern. She had the appearance of a battle cruiser and resembled our own." (*Revenge.*)

"About midnight smoke was observed ahead of *Marlborough*, which crossed from starboard to port and back again from port to starboard, and then came down the starboard side. It appeared to be a large ship and was challenged by *Revenge*, who was answered by two letters, though they were not the correct ones. She then disappeared." (Vice Admiral, First Battle Squadron.)

Commander Georg von Hase replied in part as follows:

"DEAR SIR.—I received some time ago your work "The High Sea Fleet at Jutland" and give you my best thanks for having sent it to me. Your work is excellent and it gives a superior picture of the seafight off the Skagerrak. I can bear witness that you have handled the subject throughout impartially and concisely. The battle sketches are very excellent and give the specialist a much better and clearer picture than any professional book has done yet. I am very pleased to possess your interesting book.

"As a sign of my esteem I am sending you a copy of my book, 'The Two White Nations.'

"With friendly greeting, I am, yours sincerely,

"GEORG VON HASE,

"Fregattenkapitan, a. D."

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

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Membership. Life, regular and associate, 5481. New members, 39. Resignations, 8. Deaths, 1: Rear Admiral A. F. Fechteler, U. S. Navy.

Practically the whole service receives the benefit of the PROCEEDINGS yet many officers, who read it monthly, are not members and therefore contribute nothing to the support of the Institute. Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a loss. The cost, per member, however, decreases with an increase in membership.

Dues

The annual dues ($3.00) for the year 1921 are now payable.

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Discussions

Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about $2.25 a page.

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Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 15th of each month.

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The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

The Boat Book, 1920, and the Landing Force and Small Arms Instructions, 1920, are now ready for issue. The price of the former is 50 cents per copy, and of the latter $1.00 per copy.

In the early part of the summer, the Institute will publish two books, bearing the following titles: "The Aircraft Hand Book," by Lieutenant Albert Tucker (C. C.), U. S. Navy, and "Composition for Naval Officers," by Professors Stevens and Alden, Dept. of English, U. S. Naval Academy.

The prices of these books will be announced later.

The Seaman's Hand Book, containing much valuable information for enlisted men, particularly those of the deck force, has been added to the Institute's publications. This excellent little book is retailed at 65 cents per copy.

Index to Proceedings

The attention of readers of the PROCEEDINGS is invited to the classified analytical index for numbers 101 to 200 inclusive, which is noticed under "Publications." This is a most complete index, which has been prepared at considerable expense in order to make readily available the information contained in both the articles and the notes of these issues. Only a limited number of copies are being printed. Price, bound in cloth, $2.35; bound in paper, $1.85.

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The Institute desires articles of interest to all branches of the service, including the Reserve Force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

All articles and discussions submitted by persons belonging to the navy for publication in the PROCEEDINGS must be in duplicate, one copy being signed by the author, which will be submitted to the Navy Department when the original is published, as required by General Order No. 46, of May 20, 1921.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Illustrations

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Notice

Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 146, 147, 173, 215 and 217 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., June, 1921.

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PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER H. W. UNDERWOOD, U. S. Navy

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FRANCE

FRENCH NAVAL PROGRESS.—There are ample signs on all sides that France, abominably devastated, but victorious—after displaying a patience no other great nation would have shown in her place—means at last to assert her rights as recognized by the 1918 Versailles Treaty. Moreover—a fact overlooked in England—she has no choice; bankruptcy and revolution are at her doors if the long-overdue Boche reparations are not forthcoming. The national indignation at the contrast between France's unparalleled sacrifice and the negative results obtained up to the present is such that the least delay in enforcing redress from Bocheland will overthrow the Briand Cabinet or any other Ministry weak enough to trust to conferences and scraps of paper after the unedifying experience of the last two years.

Outside of a very small minority of Socialists that have been won over to the Boche cause by the Berlin subsidies, the great bulk of the French nation is genuinely Anglophile, and would welcome naval and military co-operation with Great Britain; but, if necessary, the Republic is preparing to act single-handed, both at sea and on land. It is understood that Admiral Sagot-Duvauroux (59), now Prefet Maritime at Toulon, an officer reputed for his sangfroid and firmness, would hoist his flag in the 24,000-ton Provence (22 knots, small tubes, ten 13.4-inch guns), and eventually take charge of the "escadre et flotilles de blocus," now being formed at Brest. Toulon, like Brest, is getting alive again, and officiers de vaisseau welcome the possibility of an opportunity to work anew on the water.

The rumored adoption of extreme displacements by the English Navy for her "improved Hoods" is having a disheartening effect on French partizans of Cuirassés. France was glad to go one better than the dreadnought (24,000 tons against 18,000), but when it is a question of exceeding 40,000 tons she cannot by any means follow suit, for financial and political reasons, and so, on the motion of Chairman Dupuy, the Commission de la Marine is giving serious consideration to "Dreadnoughts de 15,000 à 16,000 tonnes," designed not to rule the ocean but simply for defensive work in the Mediterranean and round the French coasts, thus with reduced radius of action, but with stout armor and

the biggest practicable calibre, enabling them to have a say against the mightiest dreadnoughts. The 7,000-ton requins of 40 years since lacked freeboard and could not have fought in a seaway; their improved copies, the *Bouvines* (1892), were very unsteady; the *Henri IV* (1899, though remarkable, was too weakly armed. What is wanted to avoid these defects is a Patrie carrying three or four guns of 18-inch bore.

The French destroyer flotillas that have been decimated by the fearful wear and tear of the war, and also by the neglect and lack of sea practice of the last two years, are to be strengthened this year by the Normand-built *Enseigne Gabolde*, of 900 tons, 22,000 h.p., with oil furnaces and geared turbines, three 4-inch guns, and four torpedo tubes. This torpilleur d'escadre was commenced in November, 1913, and, significant enough, is the first French-built addition made to the flotillas for the last six years, Gallic yards having from the opening of the war given up new construction to devote their whole energy to ammunition and gun-making for the Allies. Consequently, she compares poorly with the many units of later designs built during the war by the British, American, and Italian navies. Yet she is an interesting craft in several respects. Her speed, nominally 30 knots, will probably exceed 35 knots on trials, the Norman firm, that 25 years since created the famed Forban torpilleur de haute mer type, being known to excel in the construction of motors. Previous boats of the same series, the *Bouclier* and *Casque* notably, exceeded 36 knots with 15,000 h.p. These records ought easily to be beaten by the *Gabolde*, that has had, besides, her armament modified by the addition of a third 100-mm. gun that has led to striking changes in her original silhouette. With her two super-imposed forward guns, she will resemble many British cruisers and destroyers.

If the 2,200-2,500-ton destroyers of the 1921 programme can be pushed forward with as much speed as is officially expected by the several arsenals and private yards that are making ready for the contracts, the *Marine Française* may regain some of the ground lost, though, considering the extremely fine designs produced within the last few years by the British and Italian Admiralties, it will not be so easy to realize the superiority for all-round quality and for individual fighting strength and speed, which is avowedly the object the Rue Royale authorities have in view in adopting unusually high displacements for their projected contretorpilleurs. With the experience of the real thing in their minds, French officers insist on two main points, viz., reliable and high sea speed and superior calibres, with a view to securing the first hits and having the upper chance in the end-on actions that are the rule between destroyers.

Admiralissimo Dartige du Fournet complained bitterly of the fragility of his 800-ton destroyers, and could only find two or three really satisfactory in the whole lot. The successive "Commandants des Flotilles de l'Adriatique" remarked that their contretorpilleurs, though superior to the Austrian on paper, could never catch them at sea, and especially lacked sufficient calibre to stop the enemy. The disclosures made at the time of the *Forget* affaire were edifying on this point. Still, since the advent of the 6-inch gun as a destroyer weapon the 5.5-inch, even improved, will be none too strong for its eventual work.

The painstaking aerial experiments of the last two years in the Mediterranean have led to tangible results, as is shown by the appointment as "chef de l'aviation d'escadre" of Lieut. Teste (28), a gifted young aviator whom his comrades had surnamed "un brave parmi les braves" for the exceptional gallantry and resourcefulness which he displayed off Dunkirk in May, 1917, in an unequal fight between four French flying machines of obsolete type and ten larger and more up-to-date Boche seaplanes, when he was wounded and, after astounding "péripeties," made a prisoner, taken to a Boche reprisals camp, whence he escaped under exciting

circumstances. To his ingenuity and daring is due the success of the comprehensive experiments (landing and flying off under the various conditions of weather and wind) carried out in the Béarn and Bapaume under the supervision of the go-ahead Admiral Violette. Obviously he is the right man in the right place, and, as he combines practical competence with "feu sacré" and a genuine faith in the high destines of aviation, he may be expected to accomplish much and to substantially add to the fighting worth of la flotte de la Méditerannée, provided he is allowed sufficient freedom of action to fully display his qualities of initiative. Up to the present the development of the French aerial wing has been hampered by the ill-will and incurable dislike for innovations of antiquated admirals, and the fact speaks for itself that, whereas the French army counts scores of flying generals, and among the most eminent, the Marine Française is still waiting for her first "amiral-aviateur," a rather bad sign at a time when maritime efficiency depends to so great an extent on aerial supremacy, especially in narrow Mediterranean waters.

The French "aviation navale," first in date in the naval arena but badly handicapped by incompetence at the head, is getting none too soon in shape when are considered the strides accomplished by the Italian and British naval flying squadrons. The lessons of the fiasco of the trans-Mediterranean group-flight organized by Admiral Ronarch have not been lost. Improvisation, impossible at sea, is, if anything, still more impossible in the air. Success to be attained requires robust and reliable machines together with a thoroughly-trained and numerous personnel, desiderata that can only be the result of constant practice and of careful fostering by the Rue Royale authorities. In addition to the Béarn (to be ready next year) and to the 800-ton porte-avions of the Bapaume class, all battleships and cruisers are gradually to be fitted to carry small "avions de chasse, d'éclairage et d'observation du Air," very satisfactory installations having been worked out, whilst heavy "avions autonomes de bombardement." too large and cumbrous for transportation on board, would operate from basis now being prepared in Corsica and on the North African sea border.—*The Naval and Military Record*, May 18, 1921.

THE MERCHANT FLEET.—The *Ligue Maritime* has issued a manifesto which reflects the general feeling of uneasiness regarding the future of the merchant fleet. While the French were fighting for their full share of the surrendered German shipping the condition of the mercantile fleet was painted in very sombre colours, and it was declared that in the absence of a fleet of her own France was absolutely dependent upon foreign freights. Now that most of the surrendered enemy ships have been delivered, and the vessels ordered from British and American yards are in French hands, it is found that there are far too many for present needs, and the harbors are encumbered with ships that are laid up through want of freights. While the tonnage before the war was only 2,500,000 tons, it will before long exceed 4,000,000 tons. The *Ligue Maritime* therefore feels that if some vitality is to be imparted to the merchant fleet it can only be done by a national effort, and it therefore appeals to manufacturers and traders throughout the country to give a preference to French boats wherever possible, for it is argued that if French ships were assured of full cargoes it would be possible to bring down freights, which are at present high on account of the operation of the eight hours' day and other charges with which foreign ships are not burdened.—*Engineering*, May 13, 1921.

GREAT BRITAIN

WARSHIP DESIGN AND TORPEDO ATTACK.—The problems associated with warship design, and especially those relating to protecting against torpedo attack, are again exercising the minds of all interested in the subject, in

view of the fact that four new capital ships are about to be laid down to take the place of obsolescent ships in the British navy. Under these circumstances it is of interest to review the question in the light of recent experience and controversy. It will be remembered that Sir Philip Watts has in two successive years, at the Institution of Naval Architects, raised the question of the protection of battleships against torpedoes. He stated that all the dreadnoughts, battleships and cruisers up to and including the *Queen Elizabeth*, were designed to be safe against the explosion of two torpedoes in any position, and sufficient stability was provided in each case to ensure the vessel not capsizing from loss of stability due to the flooding of compartments. Two battleships, the *Audacious* and *Marlborough*, and one cruiser, the *Inflexible*, were seriously damaged by torpedoes or mines; the *Marlborough* was able to fight on and arrived in the Humber 37 hours after she had been torpedoed. The repairs necessary were subsequently speedily effected.

Sir Eustace Tennyson D'Eyncourt, the present Director of Naval Construction, stated that the *Marlborough* was the only battleship of the past dreadnoughts that was torpedoed during the war, and the value of the longitudinal bulkheads and the subdivision and arrangements adopted was clearly shown, as the ship was able to remain in the line, no vital damage being done. Sir Eustace also mentioned that vessels of the "Royal Sovereign" class were provided with good under-water protection, which in certain of the ships was reinforced by adding outside bulges. These bulges were originally fitted in the "Edgar" Class, after considerable experiments had been made. He further stated that results had proved the efficiency of the bulges.

Sir Philip Watts, in the discussion on this paper, whilst approving of the addition of bulges for ships actually built, submitted that there was no advantage in providing such bulges in the design for the new ships, but asked the question: "What is the shape and construction which provided most protection against torpedo attack?" He pointed out that a torpedo may run at the surface or at any depth below the surface; if it could be compelled to run so as to hit near the ridge of the bulge, the bulge would be justified, whereas if it hits below this ridge the forces of the explosion would be directed inwards by the upper plating of the bulge against the vitals of the ship instead of being allowed to escape upwards. The internal protection seems to be about the same in the two cases. As to form alone he concluded that there was no advantage in the bulge-shaped side over the ordinary side. He pointed out that in the bulge-sided ship it was very difficult to adopt any means to prevent a torpedo from exploding before it reached the side of the ship. Sir Eustace d'Eyncourt, in reply, stated that the bulges had proved successful in resisting the attack of torpedoes. In the old ships the bulge formed a complete protection, and when the bulges were hit by torpedoes some of the hits were near the top and some near the bottom, and some at the centre of the bulge. In all cases adequate protection was given. The bulge, too, keeps the protective structure external to the ship proper; gases due to the explosion are vented in the air immediately above the bulge.

Sir Eustace d'Eyncourt, in his paper in 1920, read at the meeting of the Institution of Naval Architects, on H. M. S. *Hood*, stated that the torpedo protection consists of the bulge arrangement with an outer compartment of air and an inner one especially strengthened with the bulkheads, which renders the ship as safe from attack against torpedoes under the water as she is against gun attack above water, and that the bulge fitted to the *Hood* was different to that fitted to the earlier ships, as proved by a series of experiments by Professor Hopkinson. He also stated that trials have shown that the *Hood* can receive the blows of several torpedoes and still remain in the line without serious loss of speed. Sir Philip Watts, in discussing this paper, said that the Hopkinson device

was proposed by Lord Kelvin in the Warship Design Committee of 1905, but Lord Fisher considered the weight prohibitive. Two longitudinal bulkheads between the outer side and the bulkheads were effective, provided air spaces were fitted between them to be filled with water to take up the forces of the explosion, the bulkhead adjoining the machinery spaces having protective plating for stopping the fragments driven in by the explosion. The *Hood* was made of sufficient beam to have the wing spaces wide enough for sufficient protection.

Sir Philip Watts thought that the structural arrangements of the wing spaces in the dreadnoughts were practically the same as in the *Hood*, though not so wide. Between the outside plating of the bulge and the side plating of the machinery compartments there are two longitudinal bulkheads, the space between them being as in the dreadnoughts. The only structural difference was the longitudinal hollow along the *Hood's* side near the water line, on account of which the part below is called a bulge, and the two longitudinal bulkheads are not quite vertical. He further stated that the bulge is not an additional structure. It is a part of the whole as existing in all other dreadnoughts; the bulge does not take the place of a torpedo net. He suggested the use of plate shields outside the hull, which would destroy the torpedo before it reached the ship; these shields could be instantly got rid of if desired, but could only be conveniently stowed and carried on a ship without bulges. Sir Eustace d'Eyncourt replied that the explosion on a ship with a bulge takes place outside and does not destroy the stringer and sheer strake, which is a distinct point gained. The bulge is free from the disadvantage of a shield, which seriously reduces the speed and is difficult to handle. Sir Philip again returned to the question at this year's meeting of the Institution of Naval Architects, in discussing Sir Eustace d'Eyncourt's paper on German battleships.

It will be seen, therefore, that there is a distinct issue between the present and the earlier Director of Naval Construction as to the value of bulges. The actual amount of material used for protection against torpedo attack seems to be very little different in the case of the *Hood* and the *Queen Elizabeth;* the former having a bulge and the latter vertical sides. There is no doubt that the outside of the bulge is farther away from the vitals of the ship in the case of the *Hood* than in the *Queen Elizabeth,* but in order to obtain this the ship has to be made much broader. This advantage of the *Hood* over the *Queen Elizabeth* is not due to the bulge, but to the extreme beam of the ship. A recent correspondent to *The Times* has pointed out that the *Baden,* the German battleship which Sir Eustace was comparing to the *Royal Sovereign,* was 10 feet wider, so that it would seem as if the Germans had appreciated the benefit of greater beam, but had availed themselves of it without adopting a bulge form of construction. There is no doubt that the German ships withstood a great deal of damage without sinking, and that they were attacked by both guns and torpedoes very severely.

Sir Philip Watts and Sir Westcott Abell have recently contributed to this discussion in *The Times,* and both have called attention to the necessity for the provision of sufficient beam to ensure adequate stability should the side protection be defeated, and both are of opinion that the best way to ensure this stability as well as to obtain the protection by the best available construction of the side is a matter which deserves the most careful consideration. Sir John Biles has also contributed to *The Times* discussion without entering into the relative merits of the bulge or vertical side. He has followed up the views expressed by him at the Institution of Naval Architects, and has reminded the authorities "That a policy of secrecy adopted deliberately to avoid criticism is likely to be harmful to the country and to the science of naval design as well as those who practice it," and he urges that the design of the new British

capital ships may well be referred to a suitable committee for consideration, to the satisfaction of all concerned.

From the summary we have given above of the views of the present and late Directors of Naval Construction it will be seen that nearly all that can be said for and against the bulges in public discussion has been said and it is not easy without more detailed information, such as could be placed before a competent committee, to reach any reliable conclusion. The bulges undoubtedly were a satisfactory way of adding to the stability of existing ships, whose stability was deficient. The bulges also keep the point at which the torpedo exploded further away from the vitals of the ship. Whether this is the best way to give the ship the necessary stability and protection seems to us to be sufficiently in dispute to necessitate a thorough investigation of the question by a competent and independent committee. The protection of our battleships from torpedo attack is of vital importance so long as we rely on these battleships for our naval defence. Sir Philip Watts thinks that we should go farther than we have done and that portable shields should be carried. Undoubtedly, if they can be successfully carried they will afford another and a powerful line of defence. The matter is bristling with intricate technicalities, but no harm can be done by, and good is likely to follow, a thorough investigation. Without doubt such an investigation can only be made by considering the whole designs of our recent battleships, and a committee which could do this would have to be similar in character to Lord Dufferin's Committee of 1870 and Lord Fisher's of 1905 on Warship Design.—*Engineering*, May 20, 1921.

THE NEW SHIPBUILDING PROGRAMME.—The strategical principles underlying the Admiralty's post-war shipbuilding policy have not been disclosed, nor, according to information which is current in Parliamentary circles, is any statement on this subject likely to be made till after the Imperial Conference. It may, however, be assumed that in drafting their new programme the professional heads of the navy have taken fully into consideration the complete change brought about in the strategical outlook by the collapse of German naval power. Seven years ago the problem of naval defence was a comparatively simple one. Its solution lay in preserving an ample margin of strength in the North Sea, for, as was clearly foreseen, it was there that the only real challenge would have to be met. The strength and composition of our foreign squadrons were a matter of secondary importance. Once the German High Sea Fleet had been accounted for, either by destroying it in battle or hermetically sealing it up in its ports, the safety of British trade and oversea territories would be practically assured, for without coaling stations or base facilities abroad the German cruisers at large could only reckon on a very brief career. On the other hand, a failure to destroy or contain the German battle fleet in the North Sea would inevitably have the most disastrous effects on the sea campaign as a whole. Such was the idea that dictated our general policy before the war, and experience proved it to have been thoroughly sound. Later on the development of the submarine menace necessitated a considerable readjustment of our dispositions, but, broadly speaking, it had no effect on our strategy in the main area. To the very end of the war the Grand Fleet's command of the North Sea remained the dominant factor in the naval situation.

The influence formerly exerted by Germany on British naval policy was not confined to the distribution of the fleet. It had a very marked effect on the design of our warships. While there was never any radical departure from the traditional rule that British men-of-war should be built to go everywhere and do anything, it is certain that the dimensions, armament, and other characteristics of the vessels we built from 1905 onward were largely governed by the trend of contemporary German design. Our aim

then was always to go one better in what were believed to be the vital elements of tactical efficiency, and as a consequence we gave our ships heavier guns and greater speed than the German ships possessed. If less attention was paid to defensive qualities it was because the importance of this feature was not realized. On the whole, however, the purpose in view was achieved. The problem that now confronts the Admiralty is infinitely more perplexing. No one can foretell the future battle ground of the British Navy, and the subject is scarcely one that lends itself to public discussion. Nevertheless, there is a widely-held belief that if the navy is called upon to fight in the next ten years or so it will be in waters many thousands of miles distant from the shores of England. This conviction is apparently shared by the Admiralty, who are well aware that our present fleet is quite strong enough in ships of every type to ensure its indisputable predominance in European waters for many years ahead. If therefore, they have recommended the building of four capital ships to replace obsolete material, it is manifestly with a view to contingencies other than those of a conflict in Europe.

By this chain of reasoning we arrive at the conclusion that our new capital ships have probably been designed for a very extended radius of action. It is said that the proposal to station a powerful fleet in the Pacific has been rejected for a variety of reasons, among them being the dearth of local resources for docking and otherwise maintaining a numerous force of ships of the largest dimensions. If this is the case, and our future battle fleet is to be based on home ports, the importance of endowing the new ships with high speed is evident, for they must be capable of proceeding with the utmost expedition to any part of the world where our interests are threatened. Great cruising endurance and high speed may therefore be accepted as two probable elements in the plans of the "improved *Hoods*." Their armament and protection have doubtless been designed to embody the lessons of the war. As we have said before, the magnitude of the sum at stake entitles the public to an explanation—not necessarily technical or detailed—of the grounds on which the sub-committee presided over by Mr. Bonar Law decided in favor of perpetuating capital ships of the largest dimensions.—*The Naval and Military Record*, May 4, 1921.

THE FUNCTIONS OF NAVAL AIRCRAFT.—A rooted conviction as to the present supremacy of the capital ship affords no reason for neglecting to study the development, present and prospective, of other agencies of sea warfare whose past achievements have been such as to entitle them to rank as effective and formidable weapons. It is a highly-significant circumstance that many students who were until lately ardent advocates of the submarine should now be transferring their allegiance to aircraft. This is not surprising in view of the rapid evolution of the heavier-than-air machine, whose progress in the past few years has been incomparably greater than that of the submarine. We know that British naval officers, as a body, are far more anxious about our future in the air than about the menace of the submarine. In the case of the latter familiarity has bred not contempt, but knowledge of its limitations, which, being inherent and ineradicable, disqualify it for the position of arbiter of future naval combats. The submarine will always be dangerous, especially to a nation which is largely dependent on seaborne commerce; but it is a danger that experience has shown us how to counter. With air power the case is different. The boldest imagination cannot discern any limit to its military possibilities. It remains for the time being an auxiliary arm to navies and armies alike, but an auxiliary which has already made itself indispensable; and should its development continue at the pace which has been maintained since 1914, it will undoubtedly supersede at no remote period more than one of the instruments of land and sea warfare which now rank above it in point of supposed importance. Whether air power will ever transcend sea power

is a question which time alone can answer. What is already apparent is that sea power and air power are rapidly becoming complementary and interdependent and may soon be unable to exist apart. That is why a far-sighted and vigorous air policy is so essential to a great maritime community like the British Empire.

The public mind is somewhat hazy as to the precise functions of aircraft in the naval organization, and, indeed, it is not easy to define them off-hand. One of the clearest exposés we have seen is that given by a naval aviator in "*Flying*" (an American periodical.) He enumerates in the following order the principal duties that fall to aircraft working with the fleet in war-time. (1) Bombing enemy battleships and bases, and attack with torpedoplane; (2) protection of our own fleet from hostile aircraft; (3) scouting; (4) reporting on movements of enemy over smoke screens, in low visibility, and over the horizon; (5) detecting minefields, torpedoes, and submarines; (6) spotting; (7) escort. As regards the first, he holds that all offensive actions must be undertaken by heavier-than-air craft until a practical non-inflammable gas is in use for airships. In the late war offensive action against surface craft was of negligible value, owing to lack of opportunity, small size of bombs, indifferent bomb sights, untrained bombs, insufficient numbers of planes and material, and backward state of aerial strategy and tactics. Nevertheless, good work was done. Two German destroyers were sunk by 230lb. bombs, and towards the end Zeebrugge was attacked with 1650lb. bombs, loaded with 1100lb. of T. N. T. He considers that all daylight bombing should be formation work and guided by the principle of concentration. As with projectiles, bombs must be suited to their objectives, and the 3,300-pounders that were being experimented with when the armistice was signed would be particularly effective against capital ships and concrete defences. Smaller varieties could be used with advantage against light cruisers, destroyers, etc., while light bombs with good fragmentation would be most deadly against personnel. "With the accuracy of our new sights and the application of proper tactics and material, the importance of the future of bombing cannot be overestimated."

After explaining in some detail the use of aircraft as protectors of their own fleet, as scouts, and as detectors of submerged perils, he goes on to deal with their value as an aid to accurate long-range gunnery. Towards the close of the war the Grand Fleet, practising long-range shooting by means of aerial spotters, obtained by this means a standard of efficiency at least 300 per cent higher than from masthead spotting. It is not believed, he says, that spotting from the ship can be accurate at over 18,000 yards, whereas aircraft spotting is efficient up to the maximum range of the gun, and is not affected by smoke screens. Airships are best for this work, but their utility is circumscribed by dependence on weather conditions. As for the future of the torpedoplane, the capabilities of this weapon have been set forth by Mr. R. Blackburn, the well-known British designer, who has specialized in the production of such craft. In his judgment surprise can rarely enter into a torpedo attack by surface vessels, for the approach of a destroyer would be observed in clear weather at least ten minutes before it came within torpedo range; whereas "torpedoplanes flying at upwards of 10,000ft. can begin to glide with engine shut off, and therefore silently, some ten miles away, remaining invisible until within three or four miles, and probably undetected until much closer. Gliding at, say, 120 knots, it is unlikely they would be seen more than a minute before launching a torpedo at close range." The foregoing extracts, which do little more than touch the fringe of the subject, yet suffice to indicate the vast field of activity that will lie open to naval aircraft in a future war, and also to create misgiving as to the wisdom of entrusting the development of air-power to a department in which army influence is paramount.—*The Naval and Military Record*, April 6, 1921.

A SUPER-DREADNOUGHT AS TARGET.—*The Latest German Battleship "Baden" Sunk by Gunfire and Torpedo.*—Early in February the ex-

German battleship *Baden*, which was among the former enemy ships allocated to Great Britain, was towed from Portsmouth to Spithead and there subjected to attack by gunfire and torpedoes. According to a semi-official statement issued on February 9, "the *Baden* was subjected to short-range firing in the presence of gunnery experts, and also to aerial torpedo attacks. The object was to test the construction of German battleships and to throw light on the value of capital ships. The ship will be solved for further tests." The photograph reproduced herewith was taken soon after the conclusion of the experiments. As the first occasion on which a really modern war vessel of the largest dimensions has figured as a target ship, this experiment has created great interest in naval circles. The *Baden*, which was laid down in December, 1913, at the yard of F. Schichau, Danzig, and commenced her trials in November, 1916, embodies the latest German ideas on battleship design. The *Baden* is 590 feet long over all, has an extreme beam of 98½ feet, and her displacement at 27 feet 8 inches, 28,074 tons. She represents the latest German ideas in battleship construction.

As regards armor and protective plating, the *Baden* has a main belt 13¾ inches thick, which tapers to 6¾ inches at the lower edge. This is surmounted by a strake of 9⅞ inches armor extending to the upper deck, and the citadel is enclosed by transverse bulkheads. Beyond the main belt there is plating of 6 inches up to the bow and stern. The secondary battery is armored with 6¾-inch plating, the deck above the battery being about 1½ inches thick. Deck protection is less substantial than might have been supposed. The protective deck proper is only 1⅜ inches on the slope, but abaft the citadel this deck increases in strength till it reaches its maximum thickness of 4¾ inches over the steering gear. Forward of the main belt the protective deck is 2⅜ inches thick. The barbettes have a maximum thickness of 13¾ inches, the turrets being 13¾ inches thick at the front, 9⅞ inches at the sides, and from 4 inches to 4¾ inches on the roof. The forward conning-tower is built up of 13¾-inch armor, with a 5⅞-inch roof. The coal bunkers are so arranged that they extend all the way above the protective deck from the foremost to the aftermost barbette, and when filled with coal add considerably to the sum total of protection. Armor gratings of the usual pattern are fitted to all openings in the forecastle and protective decks. So much for the defense against gunfire.

In the *Baden*, as in every other German warship of modern construction, great pains have been taken to minimize the effect of submerged explosions, an object facilitated by the generous beam of the ship. The principal defense against torpedoes consists of a longitudinal bulkhead which runs throughout the major length of the ship. It has a uniform thickness of 2 inches, and is closed at each end by 1⅜-inch athwartship bulkheads. There is, in addition, a very elaborate system of pumping and flooding, which war experience showed to be more effective than mere passive resistance by means of subdivision. When the ship went into action the commander was posted at a station below deck, where his sole duty was to keep the ship on an even keel. From his central station he could communicate by voice-pipe and telephone with the pumps, sea-cocks, and auxiliary leak-control stations. A pendulum showed him at a glance the exact trim of the ship, while a diagram board indicated the quantity of water which could be admitted to each compartment and the effect which flooding would have on draught, heel, and general trim. The whole ship's company had been thoroughly trained in this work, partly by periodical drill and partly by means of an instructional model, which produced in miniature the subdivision of the hull. Thanks to these careful precautions German ships which received in action injuries of the gravest description were brought safely into port, the *Derfflinger* and *Seydlitz* after the Jutland battle being cases in point.

The *Baden* was armed with eight 15-inch, 45-caliber rifles in four center-line turrets; sixteen 5.9-inch 45 caliber rapid fire guns; eight 3.5-inch 45-caliber anti-aircraft guns, and three 23.6-inch submerged torpedo tubes. An interesting feature of the main armament is the extraordinarily light weight of the 15-inch gun, which weighs only 76.2 tons. On the other hand, the projectile is much lighter than that of the British 15-inch gun, weighing only 1,652 pounds as against 1,930 pounds. Its muzzle velocity is 2,625 feet-seconds, and at 16 degrees (the maximum elevation of which the *Baden's* guns are capable) the extreme range is 22,200 yards. Of the three torpedotubes fitted, the bow tube is horizontal and located 19 feet below the load waterline, while the broadside tubes are depressed two degrees and set at an angle of 20 degrees before the beam, the centers of the tubes intersecting the ship's side at points 13 feet below the load waterline. The torpedoes used in this ship are believed to be the largest extant. Their diameter is 23.6 inches, the length 23 feet, and the total weight 2.16 tons, of which 551 pounds is represented by the bursting charge. Set at a speed of 28 knots these formidable engines have a range exceeding 14,000 yards.

Before being fired at, certain modifications are understood to have been made in the *Baden,* and the foremost turret was removed. Few authentic details of the bombardment are available, but it is known that the vessel succumbed far more quickly than had been expected. According to statements published in the press, the firing ship was the old monitor *Lord Clive,* which during the war carried a pair of ancient 12-inch guns and, subsequently, a single 18-inch gun, with which she shelled the German positions at Zeebrugge. For the *Baden* experiment the *Lord Clive* was fitted with a triple 15-inch gun mount, the first mount of this kind to be used in the British Navy. It is reported to be in contemplation for the four new battleships of the current shipbuilding program, which may therefore mount ten 15-inch guns in two triple and two double turrets, arranged as in the U. S. S. *Oklahoma;* or, possibly, twelve 15-inch guns in four triple turrets, corresponding to the arrangement of the U. S. S. *Indiana.* On this point, however, there is no definite information, and it is by no means certain that the designs of the new type have been finally approved. Nevertheless, the fact that a triple mount for heavy guns has been made and experimented with marks, a distinct epoch in the development of British naval ordnance and indicates the belated adoption of a system which has long been in vogue in the navies of the United States, Italy, Austria and Russia.

Although the *Baden* was shelled at short range, the velocity of the projectiles is believed to have corresponded to a range of about 10,000 yards. The effect was surprising in view of all that has been heard about the super-excellence of Krupp cemented armor plate made at Essen. Round after round cleanly perforated the 13¾-inch belt, and in some cases projectiles impinging at an oblique angle punched their way right through the thickest armor. Under this heavy punishment the great battleship soon displayed signs of distress. Water entering through the numerous shell holes 'twixt wind and water gave her a heavy list to starboard, and long before the specified number of rounds had been fired she heeled gently over and sank, coming to rest on the shallow bottom with most of her hull above water. It is not quite certain whether the torpedo-planes which had been detailed to administer the coup de grâce made their attack before or after the bombardment, but in any case one or more torpedoes were dropped from the air and are said to have found the target. Sir E. T. d'Eyncourt, the Director of Naval Construction, has stated that the *Baden's* armor showed a degree of resistance considerably inferior to that of British armor of the same dimensions. A further point demonstrated by the test was the great improvement which has been made in the quality of British armor-piercing shell since the Battle of Jutland.

In that action, according to Lord Jellicoe, many shells broke up on striking the thick German armor, though there is protographic evidence that a large percentage got through and exploded with terrific effect inside the ships. Views have been published showing clean perforations of the 12-inch belt and barbette armor of the *Seydlitz*, *Derfflinger*, etc., and Commander von Hase, gunnery officer of the *Derfflinger* at Jutland, has admitted in his book, "The Two White Nations," that the two after turrets of his ship were totally wrecked in succession by direct penetrations from British 15-inch projectiles which exploded after passing through the barbette armor.

Interesting as these *Baden* experiments have doubtless been, they will be surpassed in educational value by the test which is to be made this summer with the British battleship *Agamemnon*. This old ship, of a type intermediate between the pre-dreadnought and the dreadnought, is now being equipped as a movable target under wireless control, and will be attacked by the guns of the Atlantic fleet. The speed and course of the target will be unknown to the firing ships, and as the practice is to be at considerable range the experiment should result in valuable evidence as to the present efficiency of the British fleet at long distance firing.—*The Scientific American*, May 21, 1921.

JAPAN

AMERICA AND THE ANGLO-JAPANESE ALLIANCE.—No greater menace to the British Empire could be imagined than that England should find America arrayed against her with the British Dominions at America's back, and yet this peril is "implied in possibilities" of the Anglo-Japanese alliance. Such is the somber presentiment of some British observers, and it is in no way brightened by various official and unofficial utterances in Canada, Australia, and New Zealand to the effect that the chance of the dominions ever fighting against America, should America become embroiled with Japan, is "so remote as to be scarcely conceivable." The whole question of the alliance is to be threshed out at the coming Imperial Conference in London, we are told, when the dominions are expected to "speak out in meeting," with a voice that was trained in the World War, on other questions besides the alliance. But on the latter subject there is intense concern in some quarters, as may be gathered from the avowal of the conservative London *Spectator* that "an alliance between England and Japan was never meant and never could be used against America," but until now "we have left the most important argument on our side unstated," and this weekly continues:

"Even the most widely imperialistic and aggressive of Britons do not contemplate with pleasure the blowing of the British Empire into smithereens in a single instant. We all know perfectly well this would be the result if we went to war against America, not to support some rights of our own, but in order to help the Japanese. The moment such a war was declared the bonds that united us with our dominions would be severed.

"If the people of Australia and New Zealand were asked on which side they were going to be in a war between America and Japan they would not hesitate a second. They would not waste time in reading diplomatic papers or considering legal points. They would say:

"'With our own flesh and blood! If the poor old mother country has gone mad we can not help it. We are deeply sorry, but if things have come to this pass we must reluctantly take the leadership of her elder daughter rather than herself. Help the Japanese to take San Francisco by assault! Good heavens! what are you talking about?'

"The same dreadful message of disintegration would run from one end of Canada to the other with similar vehemence. There could be only one place for Canada in a finish fight between Japan and America—by the side of America.

"White South-Africans would have the same answer. Nor would that be all. The moment they realized what had happened 99 per cent of the

population here would be stoning their own government for the criminal lunacy of backing Japan against their own flesh and blood."

The Spectator goes on to say that one of the reasons for continuing the alliance with Japan has been to keep peace and to be able to calm Japan's population should it become excited on "a point of honor." Also, it suggests two possible British proposals to the United States, although it admits they would be "furiously denounced by thousands of so-called naval experts in America and in England," and explains:

"The first of these would be to make our position absolutely clear to the whole American people and also to the people of our own empire, declaring we would not renew the Japanese alliance, although, of course, we would remain in perfect amity with Japan. Next, we should propose a naval convention with the United States. We should say to America: 'You shall take over command of the sea throughout the Pacific and carry on the policing of it. Just as you will be answerable for the Pacific, so we will have command of the sea in the Atlantic, which means not only all the northern waters of Europe and the Mediterranean, but also the waters encompassing the western and southern coasts of Africa.'"

But this view is founded on misrepresentation and misunderstanding of the alliance, declares the Auckland *Weekly News*, which cites as a piece of misrepresentation the arguments of American Anglophobes that "if the United States became involved in war with Japan on a Far-Eastern question Britain would be bound to enter the struggle." This is not so, flatly declares this weekly, which explains that—

"British statesmen have been careful to exclude a possibility which would do so much violence to British sentiment and instincts. In 1911 the following new clause was introduced into the treaty: 'Should either high contracting party conclude a treaty of general arbitration with a third Power, nothing in the agreement shall entail upon such contracting party any obligation to go to war with the power with whom such treaty of arbitration is in force.'"

Melbourne dispatches report the Australian Premier, Mr. William M. Hughes, as saying in concluding a debate in the House of Representatives on the coming Imperial Conference, that "the chief problem before Great Britain is to draw up a treaty which will not involve us or Britain in a struggle with the people of the United States." What is more, the Premier averred that—

"The hope of the world depends upon some sort of an understanding between America and the empire, and it is to find a way of realizing that hope that the minds of those attending the Imperial Conference should be directed.

"It is unthinkable and not within the bounds of possibility that we should ever take part in a struggle against America. We can not be bound by any treaty which we do not ourselves ratify, although the practical consequences of war between Britain and America, whether Japan was or was not her ally, would of course have to be faced by us. But even if this treaty be renewed it will not bind Australia to go to war with any country in the world."

As an indication of Canadian sentiment we have the unreserved declaration of the Kingston *Standard* that—

"It is unthinkable that, in the event of war between Japan and the United States, Canada would ever be found ranged on the side of Japan, even though the proposed renewal of the treaty between Japan and Great Britain should be consummated. Canada has nothing whatever in common with Japan; she has, on the other hand, much in common with the United States, since in effect we are one and the same people, speaking the same language, living side by side at peace for over a hundred years, and with like ideals, aspirations, and high resolves."

But the Montreal *Daily Star* derides "those Americans who hope that Canada and Australia can be split away from the British Empire on the

Japanese issue," because the Anglo-Japanese alliance is "a larger question than our own irremovable feeling against Asiatic immigration," and it adds:

"The men in Great Britain who have guarded the confines of the empire successfully through the centuries have other things to consider, and they may feel that an alliance with the strongest Power to-day in Asia—if not in the entire Old World—is an asset in these unsettled times which is not to be tossed light-heartedly over the shoulder because the American people can misunderstand it if they insist upon doing so. For they can only regard the Anglo-Japanese alliance as anti-American by deliberately reading all the documents in the case in the contrary sense.

"Suppose Britain refused to renew the Japanese alliance? It would be almost impossible to prevent that action from falling upon the sensitive Japanese cheek like a blow. Japan would be roughly hustled out of the circle of British friends. Where would she go? Does she look to you like a Power which would stand alone and patiently accept the bitter wages of isolation? Or do you not imagine that she might turn up as the protector of Soviet Russia, possibly the champion and beneficiary of the effort of the Soviets to rouse China and India, the spear-head of an Asiatic 'Monroe' movement, and ultimately, perhaps, the nurse and emancipator of Germany."

In sharp contrast is the attitude of the Toronto *Mail and Empire*, which wonders whether the alliance "has not served its turn and had its day." The Far-Eastern question has been changed by the war, according to this daily, which proceeds:

"Japan's alliance has not proved serviceable to Britain in preventing the spread of Soviet Russia's power in Asia Minor, in Persia, and in Afghanistan. For dealing with the new world questions that are looming up the Great Powers should study to avoid unnecessary commitments and entangling alliances. It is recognized more than in previous times that much that formerly fell to what were called coalitions, concerts, and holy alliances can now be left to a permanent grand international agency such as the League of Nations is meant to be."

Among the Japanese press the Tokyo *Nichi-nichi* is aware that the public opinion of Canada, South Africa, Australia, and New Zealand is inclined to oppose the renewal of the Anglo-Japanese alliance, and it bids Japan take due note of this tendency. Moreover, American opinion "takes the line that as a practical issue it is unthinkable that the American Navy should be restricted while the Anglo-Japanese alliance continue to exist," and the *Nichi-nichi* remarks:

"It is general knowledge that the alliance was concluded with the object of maintaining peace in the Orient and consequently of preserving the peace of the world. Yet we find the opinion expressed that the Anglo-Japanese alliance is an obstacle in the way of disarmament, an arrangement designed to promote the peace and prosperity of the world. It is open to doubt whether the existence of the alliance is an obstacle to disarmament, but it is very clear that it is not desirable that such misgivings should be entertained by America, a country with which we are on friendly terms. This is especially the case as the influences which were considered subversive of the peace of the Orient at the time the alliance was concluded have now collapsed."

Those Americans who oppose the renewal of the alliance, says the Tokyo *Yorodzu*, fail to perceive that it is "necessary for the maintenance of peace in the Orient, and makes the functions of the League of Nations more effective locally," hence, "it is impossible for us to see what are the real intentions of the opponents of the alliance."

The Australian Premier's pronouncement, which is quoted above, was submitted to Baron Hayashi, Japan's Ambassador at London, by a representative of the London *Times*, who records the Ambassador's impressions as follows:

"Such a clear expression of opinion could not fail, he thought, to have good results. He had no doubt that it would be welcomed in Japan, where there was a desire to meet the wishes of Australia, Canada, and the United States. Co-operation was the aim of all parties, and he felt sure that in any renewal of the alliance between Japan and Great Britain there would be nothing to which the United States could take exception. It was absolutely necessary for Japan that she should possess the friendship of the United States. The Ambassador went on to say that he was convinced that in good time Australians would come to realize that Japan entertained no aggressive or mischievous designs. Her one idea was to cultivate friendly relations.

"Turning to the question of naval armaments, Baron Hayashi said that Japan had no desire to possess a fleet which was larger than she deemed necessary to maintain her interests and defend her possessions. So long as the Anglo-Japanese alliance lasted Japan was bound to remain on friendly terms with all the dominions, and it was not the wish of the Japanese that any other situation should arise."—*The Literary Digest*, May 21, 1921.

RECENT NOTES ON JAPAN.—The outstanding feature of prevailing conditions in Japan at the present time is the protracted struggle for power between the militarists and the liberals.

While this struggle is an inevitable concomitant of all monarchial forms of government, it naturally reaches an extreme whenever there is a demand on the part of the people for some evidence of reform leading to self-government. Japan represents the survival of the old ideals of a monarchy wherein the ruling house governs by "divine right," and where the proprietary aristocracy is almost if not quite representative of the traditional superiority of the military class. There still exists among the masses an almost superstitious reverence for the *samurai*.

There are in Japan far-seeing and experienced political leaders who with the commercial and industrial circles of the country, are engaged in an effort to institute needed reforms consistent with a growing tendency to world democracy, and to develop the industrial resources of the country by peaceful methods. In these efforts they are constantly balked by the intercession of the militarist leaders, who have their own ideas as to what sort of reforms are desirable.

The power of the military party being deeply rooted in the ideals of the Japanese people, the more progressive leaders of public opinion make little progress.

The Minister of War and Minister of the Navy are *ex officio* members of the Ministry—members of the legislative chambers having no influence over them. This fact constitutes the bulwark of the power of the military party, which power was greatly increased by allied intervention in Russian affairs because it forced the necessity of maintaining Japanese troops in Siberia and gave the reins of government into the hands of the militarists.

National pride compelled the payment to these expeditionary forces of a wage nearly equivalent to that paid by the Allies to their troops.

The rank and file of the people of Japan proverbially are trained to habits of extreme frugality, to the strictest self-sacrifice and restraint, and thus the men of these troops were enabled to send back to their relatives at home the greater part of their wages to be invested in small business—characteristic of Japanese industrial ideas and representing a degree of affluence from the Japanese point of view.

An almost unprecedented period of prosperity self-evidently brought about by a reign of militarism resulted in a wave of popular support of the military party, the masses being led to hope that their success would continue if the military party were kept in power.

Thus the leaders of the military party were faced with the necessity of supplying some excuse for maintaining the troops in Siberia—an excuse which only the continued intervention of the Allies could warrant.

In this way the question of intervention in Siberia has become for Japan a question of home politics rather than of foreign policy.

The absence of any power in the Far East comparable with Japan forced the leaders of the military party to seek afar for something that might justify increased appropriation for military and naval purposes without which the life of the military party would be at an end. The act of the California legislature has given a plausible excuse to raise a hue and cry about Japan having her hands free in Far East questions. The results of the Vanderlip concession have had a similar effect, notwithstanding the fact that Japan has identically the same concession in the name of Mr. Nasamura, well-known industrial magnate of Yokohama and member of the Diet.

"Competition with America in the Far East" is the slogan of the military party, while co-operation with America is not only the dream of all far-seeing financial and industrial leaders of Japan, but also the solution of the internal strife—the struggle between the two parties. With such co-operation assured, all danger from other conflicting interests in the Far East would be at an end. It is for America to decide the future.

The Japanese Navy may be estimated as follows:

Effective Force:

Old Type: Cruisers 4; battleships of pre-dreadnought type 7; light cruisers 7; destroyers 70; submarines 20.

New Type: Dreadnoughts 4; cruisers—dreadnoughts 8; light cruisers 34; destroyers 77; submarines 80.

In construction: Dreadnoughts 11; cruiser-dreadnoughts 8; light cruisers 41; destroyers 147; submarines 100.

The first condition of naval strength is fuel; oil as fuel increases naval efficiency in battle because it permits of a longer period of action without refueling. It also increases speed because of homogeneous and modern conditions of firing.

Therefore, the fuel question is the most formidable of the problems now facing the Japanese Navy. Japan has no sufficient source of oil supply outside of America. Recently two limited companies were created with the assistance of the government for the purpose of acquiring the necessary quantities of oil and to build tanks for its safe storage in different parts of the country.

In accordance with the lessons learned during the late war, reorganization of the army on a new basis is proceeding.

Brigades are to be abolished. The plan is to create divisions consisting each of three regiments. In accordance with the reorganization project, Japan will have in the near future 32 army divisions and 1 guard division.

On the 1st of January, 1921, the gold reserve was 2,183,000,000 yen. From this stock 884,000,000 yen were at the disposal of the government and 1,294,000,000 yen were in the Japan State Bank.

Export trade for the year 1920 amounted to the sum of 1,928,864 yen; import to 2,320,712,000 yen. In 1919 the export trade amounted to 2,098,872,617 yen and the import to 2,173,459,880 yen.

The decrease in exports is partly explained by the interference of the government in the domain of commerce; so the government has vetoed the falling down of prices for some export articles, as for instance, raw silk.

It is interesting to note that the amount of exports from the port of Yokohama for 1920 fell to 25 per cent below that of 1918.

The total expense amounted to 1,562,542,797 yen. Of this sum, 183,290,831 yen is designated as "ordinary military expense," and 144,811,078 yen as naval expense.

For extraordinary military expense a sum of 79,853,871 yen is provided, and for that of the navy a sum of 358,826,000 yen. These expenses are in excess of those of the previous year by 227, 187, 480 yen.

The government is planning the construction of new railways and the building of central stores for rice, as a means of decreasing unemployment.

As we go to press, reports are current in the daily papers that the Japanese Government has requested from the Diet an additional appropriation for defenses, amounting to 50,000,000 yen, 40,000,000 yen of this sum being required for the navy "to meet the increased cost of construction of warships."—*National Service*, April, 1921.

JAPAN'S NAVAL EFFORT.—Since Japan does not unduly advertise her armaments, the extraordinary efforts she is now making to strengthen her position as a naval and military power are not fully appreciated abroad. It is certainly not common knowledge that Japan, in the current year, is devoting no less than 48.7 per cent of her total revenue to the navy and army. Naval armaments alone represent an expenditure equal to 32 per cent of the entire Budget. An analysis of this expenditure reveals the interesting fact that 55 per cent of the money voted for the navy goes toward new construction. The Philadelphia *Public Ledger* prints a table showing the proportion of national income which the three leading naval powers are at present spending on new naval construction, as distinct from other branches of the naval service:

Japan	17.5 per cent.
United States	1.6 " "
Great Britain	1.1 " "

According to the *Public Ledger*, this shows that Japan is putting forth ten times as much effort in naval expansion, in proportion to her national budget, as the United States, and about fifteen times as much as Great Britain. It further shows that since Germany in 1914 set aside 221,000,000 marks, or only 6.2 per cent of her income, for the benefit of her navy, while Japan in 1921-22 proposes to use 32 per cent of her income for the like object, Japan is making a five-fold greater effort in naval expansion than Germany made in the last year before the war. Reducing the German naval estimates of 1914-15 to yen, at the rate of two marks to the yen, the following comparison is obtained:

German naval budget, 1914-15	Yen 110,500,000
Japanese naval budget, 1921-22	Yen 490,000,000

Making allowance for the depreciation in money values since 1914, and assuming five yen in 1921 to be equal in purchasing power to two yen in 1914, Japan, it appears, is still spending about twice as much on her navy as Germany proposed to spend in 1914-15. These figures undoubtedly offer food for thought. The *Ledger*, however, goes on to argue that when Japan has completed the present program her navy will be approximately equal in strength to that of the United States. This assertion is open to dispute. Reckoning dreadnought capital ships only, America has completed 19, and is building 16—a total of 35; Japan has completed 12 (including two "semi-dreadnoughts"), and is building, or about to built, 15—a total of 27. The Japanese total, moreover, will not be attained before 1928, and it is not improbable that long before that date America will have laid down additional sltips. The really significant fact is the tremendous proportion of her revenue which Japan deems it necessary to set aside for naval armaments. Her statesmen assure the world that the fleet in process of creation at such appalling cost exists solely for defense, but they do not tell us from what quarter aggression is feared.—*The Naval and Military Record*, May 4, 1921.

IRON MANUFACTURE AND SHIPBUILDING IN JAPAN.—The Japanese Special Economic and Financial Investigation Committee adopted at its meeting, held on February 14, under the chairmanship of the Premier, Mr. Hara, the national policy regarding the iron and shipbuilding industries of the

country previously decided on and recommended by the sectional committees. The following is a brief résumé of the policy in question:

It is considered most important to combine the existing ironworkers, while the iron industry should be protected by the imposition of an import duty of 10 per cent on pig iron and 15 per cent on other iron and steel, except that intended for shipbuilding, which may be exempted. Japanese manufacturers should be subsidised for the duration of the conventions to the extent of the difference between the above enhanced duties and the conventional tariff, while those employing Japanese steel for shipbuilding might be subsidised to the extent of a sum equivalent to the import duty on the same kind of steel.

Iron manufacturers should be exempt from payment of business and income taxes for a period of ten years, provided their equipment fulfils the requirements of the Iron Industry Encouragement Law, which should be revived. The electro-iron industry should be similarly protected.

Iron and steel of Japanese make might be employed in most government building works. Due protection should be given for the marine and land transportation of iron ores and iron manufactures. Japanese iron manufactures might be granted special financial facilities, while an ample supply of iron should be insured by the procuring of foreign products, the improvement of transportation methods, their economical employment and the encouragement of domestic production. The technical side of iron manufacturing might be advanced by encouraging the study of the manufacture, the linking up of the laboratories, the training of experts and the standardization of manufactures.

The existing Shipbuilding Encouragement Law is held to be inadequate for the protection of the industry, and it is considered important to exempt from import duties the steel and wood necessary for building and repairing vessels—including warships—in order to place the Japanese shipbuilders on an equal footing with foreign manufacturers; also to exempt from import duties, fittings, engines and other parts, including half-finished vessels, which cannot be manufactured in Japan or may not be manufactured on account of patents.—*The Engineer*, May 6, 1921.

FLYING INSTRUCTORS.—Questioned on 23rd March about the reported despatch of a mission of British airmen to join the Japanese Navy, the Secretary of State for Air said it was understood that a certain number of civilians had been engaged by the Japanese as flying instructors, but no mission had been sent by the Royal Air Force, nor had the civilians in question been sent for courses to R. A. F. stations in England. The British Government have neither sold nor sent to Japan any aeroplanes or aero engines, but it is possible that the Aircraft Disposal Company, in which the government have retained an interest, may have sold certain obsolete or surplus engines to that country.

NAVAL STRENGTH.—Sir James Craig, on 16th March, gave the following information about the Japanese Navy: Twelve battleships, excluding one attached to the Gunnery School, are at present maintained in full commission, and six battlecruisers, excluding one attached to the Torpedo School. The numbers borne on 19th January, 1921, were 76,600, made up of approximately 7000 officers and 69,600 men, all of whom were available for manning. The corresponding figure in 1914 was 55,712.—*The Journal of the Royal United Service Institution*, May, 1921.

SHIPS AND SAILORS OF JAPAN.—By courtesy of the Japanese Naval Attaché and the officers of the ship, I spent a very interesting afternoon last week on board the battleship *Kashima* at Portsmouth. This vessel and her sister, the *Katori* (to which I paid a briefer visit), do not, of course, represent the modern material of the Imperial Japanese Navy; they have already completed three-fourths of the span of "life" allotted to big warships, and,

irrespective of age, they lost a great deal of their fighting value soon after they were completed, owing to the advent of the dreadnought. But "men fight, not ships," and the visit was well worth while for the insight it gave into the character of the personnel and general service conditions in the Japanese Navy. On the naval side there has been an entire absence of ostentation in connection with the visit of the Crown Prince. The voyage was made not in one of the latest and mightiest fighting ships of the Imperial fleet, but in an obsolescent vessel already relegated to the second line, and escort was furnished by a sister ship. Nor in other respects has any attempt been made to create an artificial impression.

I asked a lieutenant of the *Kashima* whether the men had been picked for the voyage, and he replied "No," the ordinary complement already on board had been retained, and this was true of the officers also, excepting certain members of the staff. In the *Katori a suite* of apartments, quite simply furnished, and a special cabin on the shelter-deck were provided for the Crown Prince, but beyond this no alteration of any kind was made in either ship. Having gone practically all through the *Katori,* I came to the conclusion that the Prince's staff must have been rather cramped for room. A pre-dreadnought battleship makes at best an indifferent Royal yacht, but it was, I am assured, the Emperor's particular wish that the entire arrangements for his son's voyage should be characterized by simplicity and lack of display.

The admiral's cabin in the *Kashima* is comfortable, furnished with the exquisite taste that one naturally expects from the Japanese, but by no means luxurious, and the captain's quarters are severely plain. The wardroom is small and somewhat cheerless from our point of view. It is very evident that creature comforts do not enter largely into the Japanese scheme of man-of-war organization. In these two ships space that otherwise would have been available for berthing accommodation has been sacrificed to military efficiency. The 6-inch battery takes up an enormous amount of room, as each gun is in its own large casemate, perfectly isolated, and giving the crew plenty of elbow play. In fact, with the exception of the *Baden,* I know of no ship in which the broadside battery guns are so well protected as in the *Kashima.* On the other hand, the four single 10-inch gun turrets do not seem to be well placed, and probably interfere with the 12-inch main armament. The 10-inch guns are worked hydraulically and the turrets are fairly large, but when the full crew of 19 are inside there cannot be much room to spare. In both ships the officers spoke very highly of the workmanship in the vessels themselves and in their machinery, armament, and general equipment. Said one: "These British-built ships have never given any trouble, and they are as sound to-day as when they were delivered to us. The only change we have made in them was to modify the boilers. But for the new tactical standards set up by the dreadnought these two ships would still be in our first battle fleet. They are, and always have been, very popular ships with us."

The voyage on the whole was favored by fine weather, but heavy seas were encountered near Malta and again in the Bay of Biscay, and on the latter occasion the battleships rolled rather badly, as well they might considering the weight they carry topsides. Few changes have been made in rig or general appearance since the ships left England fifteen years ago, though both underwent big refits during the war. The torpedo nets have been removed, though perhaps only temporarily, as the shelf and the boom fittings remain, and two small Q.F. are now mounted on the crown of each 12-inch turret. Neither ship is fitted for director fire, and the largest range-finders at present on board are of the 10-feet base type. Very possibly, however, the ordnance equipment in these two ships does not represent the latest Japanese practice, even in the pre-dreadnought squadron.

The mess decks are, if anything, roomier and more comfortable than those in contemporary British battleships. Although the *Kashima* was coaling at the time of my visit, by some miracle the dirt and noise were

localized and did not penetrate unduly to the after part of the ship. The men were putting an extraordinary amount of energy into their work, and if coaling ship is always conducted on the same lines, I shall say that the Japanese Navy easily holds the world's record. Hard work seemed to conduce to cheerfulness, for there were smiling faces everywhere, and all appeared to look upon coaling as a rich joke. Outwardly there was no trace of the iron discipline with which some writers have credited the Japanese Navy. The men, I noticed, were far more self-reliant and far less servile in their bearings towards superiors than was the case in the old German Navy. Orders were given quietly and obeyed with cheerful alacrity. The saluting was most punctilious, not only between officers and ratings, but between the officers themselves. My impression is that the Japanese conception of discipline differs very radically from the Western conception, but that it is wonderfully good, and doubtless well suited to the Japanese temperament. The officers are manifestly absorbed in their profession and exceedingly well-informed on the world's naval affairs. The plain, almost sombre uniform, with the "stripes" in black braid instead of gold, consorts well with their quiet, earnest demeanour, but they soon become vivacious when the talk turns on "shop." They have few relaxations, but one lieutenant confessed to me that his "hobby" was "reading naval war literature," of which he certainly had an imposing stock. A certain British admiral would have liked to hear this officer's quaint but flattering tribute to his book.

Among the men the average of physique was excellent. They are well fed, and the story in one London paper of their "wholesome but rather monotonous diet of rice and beans" is moonshine. They have a generous meat ration at dinner every day, and, as a rule, fish for supper. For recreation they play shuffle-board, quoits, and other deck games, but I was told that wrestling is their favourite pastime. The men's library contained nearly a dozen books in English—including certain popular novels, and several quite passable English scholars were pointed out to me. If these men of the *Kashima* are typical there is nothing wrong with the Japanese lower-deck personnel. Indeed, one might say of the *Katori* and Kashima, their officers and their men, that if the rest of the Japanese Navy is "up to sample" the honor of Japan is safe in the keeping of her seamen.—*The Naval and Military Record*, May 25, 1921.

UNITED STATES

LAUNCH OF SUBMARINE "S-48."—The U. S. submarine *S-48*, launched on February 26 at the works of the Lake Torpedo Co., Bridgeport, Conn., is the first of the ten vessels of the *S-42* to *S-51* group to be launched, and is about 75 per cent completed. The displacement is about 993 tons, and the vessels are 240 feet in length overall; beam, 21 feet 6 inches; draft, about 13 feet 6 inches in normal surface condition.

The vessel is of the double hull type for about one-half the length amidships, the forward and after portions of the hull being of the single-hull type. The hull must withstand with safety a submergence test to 200 feet. Particular attention has been given to providing ample strength to ensure against rupture from explosion of depth charges. Strong bulkheads divide internal spaces into six watertight compartments, so proportioned that the vessel will still float if any one compartment is damaged and flooded.

The vessels are propelled on the surface by two Diesel engines, each driving a screw propeller, rated at 950 brake horsepower each. Submerged, the vessel is driven by two electric motors taking their power from a lead-acid storage battery. These motors also act as electric generators for charging the storage battery, being driven by the Diesel engines when operated on the surface or when at rest with propeller shafts uncoupled. The fuel oil system is of the "floating" type, oil used being automatically replaced by salt water.

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AND PROBABLE DATES OF COMPLETION, AS REPORTED MAY 31, 1921

Type, number and name	Contractor	Per cent of completion			
		June 1, 1921		May 1, 1921	
		Total	On ship	Total	On ship
Battleships (BB)					
44 California	Mare Island Navy Yard	97.	97.	96.5	96.3
45 Colorado	New York S. B. Cpn	73.1	71.3	71.3	69.4
46 Maryland	Newport News S. B. & D. D. Co.	99.2	98.9	98.3	97.8
47 Washington	New York S. B. Cpn	65.	58.5	63.1	56.3
48 West Virginia	Newport News S. B. & D. D. Co.	54.1	44.4	52.1	42.4
49 South Dakota	New York Navy Yard	30.5	22.3	29.1	21.1
50 Indiana	New York Navy Yard	28.	20.7	25.8	17.8
51 Montana	Mare Island Navy Yard	24.4	15.2	22.1	13.2
52 North Carolina	Norfolk Navy Yard	32.3	23.1	29.4	21.
53 Iowa	Newport News S. B. & D. D. Co.	23.	19.	19.3	15.4
54 Massachusetts	Beth. S. B. Cpn. (Fore River)	6.4	.9	3.	.5
Battle Cruisers (CC)					
1 Lexington	Beth. S. B. Cpn. (Fore River)	18.7	9.2	16.6	6.5
2 Constellation	Newport News S. B. & D. D. Co.	10.5	7.7	9.3	6.3
3 Saratoga	New York S. B. Cpn	22.4	13.4	20.4	11.8
4 Ranger	Newport News S. B. & D. D. Co.	1.8	.7	1.6	.9
5 Constitution	Philadelphia Navy Yard	7.7	4.	6.	2.9
6 United States	Philadelphia Navy Yard	7.7	4.	6.	2.9
Scout Cruisers (Light Cruisers CL)					
4 Omaha	Todd D. D. & Const. Cpn	92.1	83.4	91.4	82.7
5 Milwaukee	Todd D. D. & Const. Cpn	89.2	80.9	88.3	79.7
*6 Cincinnati	Todd D. D. & Const. Cpn	81.7	74.1	80.6	68.9
7 Raleigh	Beth. S. B. Cpn. (Fore River)	56.7	38.8	53.8	35.2
8 Detroit	Beth. S. B. Cpn. (Fore River)	56.6	38.7	53.6	35.
9 Richmond	Wm. Cramp & Sons Co.	66.	40.	64.	38.
10 Concord	Wm. Cramp & Sons Co.	63.	37.	62.	36.
11 Trenton	Wm. Cramp & Sons Co.	45.	25.	44.	22.
12 Marblehead	Wm. Cramp & Sons Co.	43.	22.	42.	20.
13 Memphis	Wm. Cramp & Sons Co.	37.	19.	35.	14.
Auxiliaries					
Fuel Ship No. 18, Pecos	Boston Navy Yard (Oiler AO 6)	88.	87.5	82.5	81.6
Repair Ship No. 1, Medusa (AR 1)	Puget Sound Navy Yard	62.4	47.7	60.6	44.5
†Dest. Tender No. 3, Dobbin (AD 3)	Philadelphia Navy Yard	62.3	62.	57.3	57.
Dest. Tender No. 4, Whitney (AD 4)	Boston Navy Yard	25.	16.5	21.	12.5
Sub. Tender No. 3, Holland (AS 3)	Puget Sound Navy Yard	17.8	2.5	16.8	1.4
Aircraft Tender, Wright (AZ 1)	Tietjen & Lang	76.	....	70.	....
Patrol Vessels					
Gunboat No. 22, Tulsa (PG 22)	Charleston Navy Yard	67.7	48.	64.6	44.7

*Scout Cruiser (Light Cruiser), No. 6—Launched 5/23/21.

†Destroyer Tender No. 3—Launched 5/5/21.

In addition to the above there are under construction 4 destroyers, 37 submarines, and 4 fleet submarines. Authorized but not under construction or contract 12 destroyers, 7 submarines, and 1 transport.

There were delivered to the Navy Department during May, 1921, 4 destroyers.

The armament consists of four 21-inch torpedo tubes in the bow and one in the stern. A 4-inch 50-caliber gun is installed on the deck forward of the conning tower. Ammunition is served by means of an inclined ammunition hoist with spring actuated cover. Three periscopes are installed, one of which has its eye-piece in the conning tower, but arranged with a platform and trunk to permit the operator to ride up or down with the periscope and take observations at any height. The eye-pieces of the other two are in the control room. The variable ballast tanks are of sufficient capacity to provide for adjustment of weight under all probable conditions. The flooding and venting arrangements are ample, and are designed to permit the vessel to be submerged in approximately one minute. The *S-48* is equipped with radio apparatus, both for surface and submerged work, and with submarine coils for receiving radio messages submerged. Submarine oscillator signalling sets are also provided. Particular attention has been given to providing comfortable quarters for the crew and the inner surfaces of the hull in way of the living spaces have been sheathed with cork. Stowage for a 14-foot boat is provided in the superstructure. (*Army and Navy Journal*, Mar. 5, 1921.)—*The Technical Review*, May 17, 1921.

MERCHANT MARINE

GOVERNMENT'S ARMADA OF INACTIVE STEEL SHIPS CROWDS JAMES RIVER.—In the James River opposite Camp Eustis, Va., there are approximately 160 steel Shipping Board vessels tied up in groups of eight, in some places three groups abreast. Most of the ships are of the "Lake" type and have proven unprofitable for operation in the coastwise and West Indian trade in normal times. The groups of ships, which are designated as "units," clutter the river for miles up and down on each side of the pier —quietly floating, orderly islands with sheer black and red steel sides and each with a forest of masts and stacks atop.

The dreamy and peaceful appearance of the scene is belied by the life on the "motherships" of the units. The men work hard aboard the vessels. In the morning they turn to at eight and begin chipping or painting or continuing whatever job is under way until five o'clock, with an hour free at noon. Many evidences of neglect, poor workmanship and graft on the part of the builders are coming to light. Usually they are defects which would be unimportant except in time of extreme danger. Then, however, they are liable to cause loss of life. Whenever it is possible, the crew put things to rights, or report the trouble if they are unable to remedy it. A defect common to many of the ships was the fact that the shackle pins in the anchor chains were "frozen" and could not be moved with a sledge hammer, making it necessary to saw the pin in half to part the chain.

Suppose that a vessel so handicapped is anchored on a lee shore during a gale and another vessel drags down on her. No time to heave up the anchor—the chain must be slipped. The crew set to work to knock the pin out of the shackle, in order to release the chain. They have only a few minutes—no time for sawing. The pin won't move! The other ship is drifting down surely and steadily! They pound it frantically but without success! Too late! The ships collide and both are swept into the surf, to be pounded to pieces. But "dead men tell no tales." On several of the ships, round pins were found forced into oval holes.

The most important and most difficult work falls to the lot of the engineers, and thanks to their activities the vessels in a number of the units will go out in a better condition than that in which they arrived. On one unit, the engineers constructed an electric welding machine and made repairs which, in a shipyard would have cost the Shipping Board many thousands of dollars. The chief concern of the deck force is to see that all the ships are securely fastened together. The vessels lie side

by side, with their bows pointed in opposite directions, so that one vessel points up stream and its neighbor down stream. Each vessel has both bow anchors out nearly to the ends of their chains, so that the average unit has sixteen anchors out, eight on each side. Even that number sometimes fails to hold. One unit dragged a hundred and fifty yards during a squall in March.

The danger of fire is the chief concern of the officers of the units. Inspections of all ships are conducted hourly, both day and night. Lines of fire-hose are stretched across the unit, and spare hose is always ready. Smoking and the use of oil lamps are not allowed on any but the mother-ships. Everything is ready so that if any ship catches fire it can be taken out of the unit in short order. The crew are drilled thoroughly in their fire-duties and everyone is ready for any emergency. So far there have been no serious fires.

There has been much talk of the ship's rotting to pieces and opinions have been expressed that they will be worthless when the time comes to put them in operation again. The general belief of the officers aboard the ships, however, is just the opposite. There is naturally a large depreciation in any laid-up ship, but it is being offset to a considerable extent by the work of the caretaking crews. The captains and engineers are doing their utmost to put the ships in the best condition, although they are somewhat handicapped by lack of men and equipment. In February, all the engineers in the fleet sent a letter to the Shipping Board asking for more skilled engineers and assistants. In support of their request, they declared that the ships would gain in efficiency and that the Shipping Board would save money by enabling these men to make many necessary repairs which otherwise would be done in a shipyard by men whose only interest in the work would be the amount of money they could get out of it. Nothing came of the appeal, however.—*The Nautical Gazette*, May 21, 1921.

WORDS OF WISDOM ON THE SHIPPING PROBLEM.—There is probably no subject, unless it be that of reparations, upon which so much has been said and written and such diverse solutions offered as in respect to the problems of our Shipping Board policy. To our thinking, the best summing up of the situation is that which was made by James A. Farrell at the recent National Foreign Trade Council Convention in Cleveland, Ohio.

Looking at the matter broadly, Mr. Farrell laid his finger at once on one root of the trouble when he said that the present conditions are the outcome of haphazard efforts to deal with a problem which from the very first called for a settled policy and a well-defined purpose. To begin with, for a period extending from the Armistice well into the year 1919, there was an opportunity to dispose of a large portion of the fleet at prices bearing a fair relation to a moderately depreciated cost. That was the time, our readers will remember, when a *bona fide* offer was made to purchase the *Leviathan*, a deal which would have gone through except for the spiteful opposition of the Hearst papers and certain other influences of a strongly anti-European favor. Through not taking advantage of this opportunity, the government, says Mr. Farrell, "missed its market," and, it is estimated, lost a chance to realize at least 800 million dollars, this sum representing the difference in the market value of the tonnage which could have been sold at that time and the value of the same ships to-day. The Shipping Board fleet cost over three billion dollars, and the question of getting rid of these ships by sale is hampered by our perfectly impossible navigation laws. We are told, moreover, that even a temporary improvement in ocean freights would fail to absorb the world's idle tonnage in less than three years. Approximately seven million tons of the world's carrying capacity is laid up out of a total of 60 million tons, of which five million tons is not yet completed.

In Mr. Farrell's opinion, we have to recognize that the policy of the Shipping Board of endeavoring to build up trade routes from every Atlantic, Gulf and Pacific port to practically every port in the world is expensive, and, under present conditions, impracticable. He believes that a partial solution of Shipping Board difficulties would be to lay up a considerable portion of its tonnage and withdraw from all but supervisory activity by chartering the steamers to reputable and experienced operators. With this policy we have always been in hearty agreement. The operation of shipping, with all its multiplied and varied activities and problems, is one of the most highly specialized branches of commerce and industry. It should be left to the genius of the men who have had long experience. The Shipping Board scheme of laying out trade routes and supporting the unprofitable lines by active and very generous financial help is attractive on paper, but, as the event has proved impossible of fulfilment, at least under the present disturbed world conditions.

But after all is said and done, Mr. Farrell lays his hand upon the most serious handicap of all when he says that the main factor in determining whether we can compete successfully with foreign tonnage is our shipping laws. From the very day on which the La Follette bill was passed the *Scientific American* has realized that this bill would be the undoing of our Merchant Marine; and everything that has happened since then has proved the fear to be well founded. Not only do our navigation laws strangle our ocean-going ships, but they are affecting even the carriers on the Great Lakes, where we have no local foreign competition. As compared with competing foreign ships on the high seas, American vessels must maintain larger crews, 65 per cent of whom must be licensed men and they must carry in the engine room crew 30 per cent more men. The solution of the shipping problem lies in chartering the boats to competent people of long experience in the shipping business, coupled with a drastic revision of our navigation laws.—*The Scientific American*, May 21, 1921.

POLICY OF DISCRIMINATIONS FRAUGHT WITH DANGER TO OUR SHIPPING.—The advocates of discriminatory tonnage dues and preferential tariff duties on goods imported in American bottoms are not idle, however. They are even proposing the enactment of new legislation calling for the imposition of a ten per cent ad valorem tax on all commodities brought into this country in foreign ships. Not even articles on the free list are to be exempt from this tax. As we have pointed out before, such unequal treatment of foreign shipping would be almost certain to evoke retaliatory measures on the part of other nations and lead to our vessels being discriminated against. The British colonies have had for some time a system of preferential duties in favor of Great Britain and would probably be glad of a pretext to impose discriminatory tonnage dues against American ships.

It is argued that any such retaliatory legislation could be offset by the simple expedient of our again raising our discriminatory charges and keeping them on a higher level than those established by foreign countries. In other words, still higher discriminations are to be imposed against nations which may rebel against the enforcement of the discriminatory clauses of the Jones Act. We should then be in the illogical position of deeming it a cause for reprisals should foreign nations venture to discriminate against our tonnage, while claiming for ourselves the right to levy any dues we saw fit on the ships of these same nations when they visited our harbors. Such an unfair attitude would be almost certain to cause commercial warfare to the resultant detriment of our shipping and of our trade. Furthermore, in the event of any such war of discriminating tonnage dues, the United States would be a heavy loser by reason of the fact that its exports are far greater than its imports. As American ships arriving in foreign ports would have to pay heavier tonnage dues than foreign vessels it would be cheaper to ship our products abroad in the latter. All that our discriminator tonnage dues could effect would be the deflect-

ing of our less numerous and less valuable import cargoes to American ships, while our far more precious export cargoes would move out in foreign bottoms. This would be a losing proceeding for us. Instead of furthering our shipping as alleged, discriminatory tonnage legislation would be certain to imperil seriously its position.—*The Nautical Gazette*, June 4, 1921.

AERONAUTICS

CALENDAR OF BOMBING TESTS.—June 21—Tuesday: Bombing of ex-German sub-*U-117* by army and navy air forces jointly.

June 22—Wednesday: Destruction *U-140, U-111, UB-48* by destroyers.

June 28—Tuesday: Search for and bombing or radio controlled battleship *Iowa* by navy and army air forces using naval aircraft only. *Iowa* to be between latitude of Capes Hatteras and Henlopen 50 to 100 miles off shore at zero hour.

July 13—Wednesday: Bombing of ex-German destroyers about 60 miles off Cape Charles light ship in 60 fathoms of water. Army and navy aircraft jointly. If not sunk by bombs to be sunk by destroyer fire.

July 15—Friday: Destruction remaining destroyers by gunfire.

July 18—Monday: Bombing of ex-German cruiser *Frankfurt* under same conditions as above. If not sunk by bombs to be sunk by big guns of fleet.

July 20—Wednesday: Destruction of ex-German battleship *Ostfriesland*. Flyers must register at least two hits with largest bombs. If vessel still afloat to be sunk by big guns of battle fleet.

Notes: Naval air forces under command of Capt. A. W. Johnson, commanding Atlantic fleet air forces, flag on U. S. S. *Shawmut*. Army air force under command of Brigadier General W. Mitchell, director of training and operations army aviation. Shore base operations under command of Capt. S. H. R. Doyle, base commander, Hampton Roads, Va. General supervision of bombing experiments in charge of Admiral H. B. Wilson, commander-in-chief, U. S. Atlantic fleet. U. S. S. *Shawmut* take station center of scouting area for *Iowa* experiment and a target in other tests.—*The Aerial Age Weekly*, June 6, 1921.

BOMBING THE RADIO-CONTROLLED "IOWA."—Among the bombing tests to be conducted jointly by the army and navy air forces the latter part of June and the first part of July, the most spectacular and interesting from the public viewpoint will be the search problem and accuracy of bombing test on the radio controlled *Iowa*, scheduled for June 28.

In one respect war conditions will be accurately simulated in this problem, for the old *Iowa*, under the control of a distant ship, will maneuver as an enemy ship, just as though she had a crew aboard, except that her speed will be somewhat reduced. Starting at a point somewhere between 50 and 100 miles at sea off the Virginia Capes, the *Iowa* will steam toward shore, while the planes from shore, starting at the same hour, will fly out to locate her. When this is accomplished, the bombing with dummy bombs will begin.

For this operation the army will use only the seven seaplanes it obtained from the navy and four airships, all of its land planes having been withdrawn from this test. The navy will have four of the *NC* type of flying boats and 12 *P-5-Ls* in the search problem and four Martin bombers, land planes, aiding in the accuracy of bombing tests. The navy dirigible probably will take part in the search problem.

In order to use the *Iowa* for a moving target, she has been fitted out with special apparatus that will enable her to be controlled by wireless from a ship at a distance. Some extensive changes in the *Iowa's* power plant were necessary, as the propelling machinery must be capable of running for a considerable time without attention. The boilers were changed

to burn fuel oil instead of coal and automatic devices for feeding the fuel to the burners and supplying water to the boiler were provided.

The apparatus for controlling the ship consists of a standard radio transmitter aboard the controlling ship, a receiving aerial on the *Iowa* with special radio receivers, amplifiers, relays, etc., for converting the radio signals into a form such that they will operate the electrical devices which control the steering gear and the throttle of the main engines.

The officers in charge of sending out the radio signals from the control ship has absolute control of the starting of the *Iowa*, steering her in any direction and stopping her when desired. The various operations which take place are as follows:

When everything on board the *Iowa* is ready, the main engines are started up and are left running very slowly. The ship is then abandoned and the officer aboard the controlling ship has control of the *Iowa*. The first radio signal sent out is intercepted by the aerial on the *Iowa* and is received by the radio receiver located well below deck.

This signal is then amplified by means of special vacuum tube amplifiers and is made to operate a very sensitive relay or switch, which in turn operates a larger relay. This large relay closes an electrical circuit which operates an electrically controlled pneumatic valve. When this valve opens, it admits compressed air to the throttle control of the main engines, which causes the throttle to open and bring the ship up to full speed.

The above mentioned relay also operates a device called a commutator, which is a special switch having control of the steering mechanism.

The steering gear consists of a standard steam engine driven rudder gear, the throttle valve of the engine being geared to a small electric motor. The commutator is connected to the control panel of this motor and is thus able to operate the electric motor, which in turn causes the steam engine to drive the rudder to either starboard or port as desired.

A very novel feature of this installation is the automatic steering, which is made possible with the aid of a gyro-compass. The compass is electrically connected to the control panel of the electric motor on the steering gear, so that the ship can be made to hold any course, the gyro-compass immediately operates the steering gear to return the ship to her course. The officer sending the control signals can steer the *Iowa* to either starboard or port or may put the gyro-compass in control and hold a steady course.

The commutator might be considered the mechanical brains of the *Iowa*, it receives the radio signals and interprets them, passing them on directly to the electric motor controlling the steering engine, if the order is either starboard or port, or giving the gyro-compass control, if that is the order.

If the officer in control desires to stop the *Iowa*, he sends a long signal of about ten seconds duration. This operates a special relay which opens the circuit on an electrically controlled pneumatic valve, which shuts off the various fuel oil and feed water pumps, thus shutting down the power plant and stopping the ship.

A special safety device is provided in the form of a time clock, which automatically shuts everything down in case the radio receiving apparatus should become inoperative, or in case no control signals were received after a certain lapse of time.

The radio receiving instruments and amplifiers are navy type instruments. The special relays for converting the radio signal to a form which can be made to control the electrical devices were furnished by John Hays Hammond, Jr. The electrically operated pneumatic valves and their controlling relays for controlling the throttle valves of the main engines, the automatic time clock, the commutator, and the electrical control for the steering gear (with the exception of the gyro-compass itself) were furnished by the General Electric Company.—*The Aerial Age Weekly*, June 6, 1921.

AERIAL CO-OPERATION WITH THE NAVY

BY SQUADRON LEADER C. H. K. EDMONDS, D. S. C., O. B. E., ROYAL AIR FORCE

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INTRODUCTION

The object of a nation at war is to stop the enemy's national life, and the strategic plan which either belligerent follows to achieve this end may be divided into three classes, viz., naval strategy, military strategy, and independent air strategy.

When aircraft are employed for reconnaissance over the sea and in co-operation with the navy the objectives must be the same as those which are the aims of the naval strategy, hence the use of aircraft against any other objectives comes under the heading of independent air strategy, or possibly military strategy, and is outside the scope of this paper.

Now the object of naval strategy is the control of maritime communications, and the destruction of the enemy's battle-fleet is the principal means to this end. The subject may be conveniently considered under the three following headings:

(a) The Battle Fleet.
(b) Commerce protection and prevention of the enemy's commerce.
(c) Support of military expeditions overseas.

In Chapters I, II, and III the use of aircraft in the late war in co-operation with the navy under the above three headings will be examined and some criticisms offered. In Chapter IV the limiting factors of various types of aircraft will be considered in conjunction with the probable requirements of future naval warfare. From this a forecast will be made of "the possible future of the various types of aircraft in a war against a first-class naval power."

Whenever "The War" is mentioned the late world conflict is meant. And the phrase "the future," unless specially stated, refers to the next ten years, for the author considers that the progress of aeronautics may be so rapid as to render impracticable conjectures beyond that period. No attempt has been made to discuss the work of aeroplanes and kite baloons in any detail, as they are not included in the "Definition of Subject" given in A. M. W. O. 915 of the 14th August, 1919.

CHAPTER I

CO-OPERATION WITH THE FLEET IN THE NORTH SEA

Evolution of the Aeroplane Carrier.—On the outbreak of war very little was known of working aircraft from ships, therefore the solution of the problem of how to provide aircraft for the fleet at sea was at once energetically sought.

Two classes of seaplane carrier were tried: a large ship with considerable stowage space for machines and considerable radius of action, and smaller ships with correspondingly less radius and stowage. In the former class was the old Cunarder, the *Campania*, for use with the Grand Fleet; and in the latter class were the *Engadine*, *Riviera* and *Empress*, all three cross-Channel packets.

By December the three last-named ships had joined the Harwich Force, and on Christmas Day, 1914, a successful air raid on Cuxhaven and Wilhelmshaven was made by the seaplanes from them. This popularized such operations. The three existing carriers were fitted with improved accommodation for seaplanes, and others of a similar class were taken up.

When the refitted ships rejoined the Harwich Force, however, attempts to make similar raids led to repeated failures and disappointments. It was found that the North Sea in average weather was too rough to permit of seaplanes being hoisted out and in. Also surprise was practically impossible because the flotilla on passage to the German coast was almost invariably observed by Zeppelins, which the low performance seaplanes were quite incapable of bringing down. The seaplane carriers, too, had only a speed of about 19 knots, consequently it was very risky to keep them near the enemy's coast once they had been observed. Therefore, the policy of raiding the enemy's naval bases continuously was abandoned, and no more than sporadic attacks were afterwards attempted.

H. M. S. *Campania* joined the Grand Fleet in the summer of 1915. Experience with her, confirming that gained with the Harwich Force, was that the use of aeroplanes from ships at sea was impracticable, that an aircraft carrier must have a speed at least equal to that of the ships with which she works, and that there was a need for both the large and the small class of carrier. Further, this experience enabled the commander-in-chief to lay down his aerial requirements for the fleet at sea as follows:—

(i) To prevent reconnaissance by Zeppelins.
(ii) To reconnoitre the enemy's fleet.
(iii) To spot for gunfire after the battle was joined.

Accordingly the pre-war experiments in flying seaplanes with wheels, or aeroplanes, off the deck of a ship steaming at high speed into the wind were pressed on, and the results were good. In the meantime the possibility of an aeroplane alighting on the deck of a ship under way became recognized, which obviated the necessity of stopping to hoist-in after a flight, with the consequent risk from submarines. The construction of H.M.S. *Argus*, with a special alighting deck, began in 1916. In the autumn of 1917 successful trials of landing an aeroplane on H. M. S. *Furious* were carried out, also the practicability of flying an aeroplane off a turret had been proved; and from this date onwards aeroplanes were carried on ships in lieu of seaplanes.

Grand Fleet's Aircraft.—At the time of the Armistice a comprehensive programme for Grand fleet aircraft was nearly completed. There were two large aeroplane carriers (*Furious* and *Argus*) and one small one (*Vindictive*), whilst two more large ones were under construction. *Argus* had torpedo machines, the other carriers reconnaissance machines.

In each light cruiser, except when prevented by questions of stability, a single-seater fighter was carried, whose primary rôle was the attack of Zeppelins.

Each battleship, or battle-cruiser, carried two aeroplanes. These were either single-seater fighters or two-seaters, so distributed that each squadron of ships had its own 'planes for spotting or reconnaissance, and fighters to protect them.

This use of aeroplanes for overseas flying was necessary, because no seaplane existed which had the necessary performance to permit of flying off platforms, or of landing on a deck, or to bring down a Zeppelin. Nevertheless, there were certain unavoidable drawbacks. Even with air-bags and hydrovanes on the chassis, the strain on the pilots and observers and the wastage of machines was greater than if seaplanes could be used. Also, to keep the personnel in practice, there must be aerodromes, lighters for landing and embarking machines, etc., at each fleet base In the war these drawbacks were not prohibitive, because as the oversea flying was only occasional the strain on the personnel was never very great, neither was the wastage excessive, as the aerodromes and shore organization could be easily provided. In peace, however, or in a war where the fleet was more at sea, the same methods might not work. This matter will be dealt with further in Chapter IV.

Kite baloons were carried in a proportion of the cruisers, T.B.D.'s and battleships, being used respectively for reconnaissance, anti-submarine work, and control of gunfire. Considering that a great division of opinion existed as to the value or otherwise of the baloons, and that shortage of either men or material, or both, was always a difficulty throughout the war, the author considers that once the aeroplane programme was accepted the kite baloons should have been given up, except in a few destroyers for anti-submarine work. Airships of sufficient performance to meet the fleet's requirements were not available during the war.

German Aircraft in the North Sea.—Having reviewed the development of aircraft with the Grand Fleet, it is appropriate to consider the enemy's naval aerial resources, before passing on to a more detailed examination of their employment. Unlike ourselves, the Germans started the war with an efficient service of large rigid airships, whose primary rôle was the patrol of the south-east corner of the North Sea. They were based on Tondern, Altona and Cuxhaven, and it is no exaggeration to say that in the region of their patrols they held the supremacy of the air. Hence, the German fleet when at sea in good weather always enjoyed aerial co-operation, the movements of any ships were nearly always screened by airships, whose great radius of action, speed range, and long endurance rendered them capable of this work.

The airship patrols were supplemented by seaplanes from Sylt, Heligoland, a station near Cuxhaven, and Borkum. Flying-boats were not used, but the German float-seaplanes were much superior to our own. They had no aircraft carriers, neither were aircraft carried aboard warships. Presumably the enemy relied on his large airships to fulfill the requirements of the fleet at sea.

Narrative of Events in the North Sea, with some observations and criticisms.—A brief review will now be made of the work of the Grand Fleet and Harwich Force, in order that the work of aircraft co-operating with them may be examined. Generally speaking, the guiding policy for our fleet was to keep the majority of ships in harbor, and to carry out continual sweeps of varying strength with the remainder. Early in the war, as already mentioned, there were no aircraft to co-operate in these sweeps, which extended far beyond the range of our aircraft working from shore bases. The direct result was that the enemy's Zeppelins, being entirely unopposed, were in a position to warn their outlying small craft; if the sweeping force was small it ran the risk of interception by a superior force suitably guided by information from the air; if the sweeping force was strong this fact was reported, and the enemy was not to be enticed out. In any case the sweeps were far less effective and much more risky than if aircraft had been available.

The only offensive operations made by the enemy's ships were three similar sweeps, during which towns on our East coast were bombarded. On only one of these occasions were we able to intercept the raiders by our surface ships and submarines. Had there existed on our side a more extensive system of air patrols, airships at long range, and seaplanes and aeroplanes closer inshore it seems that our fleet would certainly have had a much better chance.

It was in January, 1915, that our battle cruisers intercepted the enemy's, who were probably embarking on one of these sweeps. The running fight of the *Dogger Bank* took place, in which two enemy battle cruisers were sunk and one seriously damaged before they could escape behind their minefields. This gives an excellent example of an opportunity for torpedo-carrying aircraft, had they been available. One hit on each ship with even a 14-inch torpedo would probably have so reduced the squadron's speed that all would have been overtaken and sunk.

In May, 1916, the Battle of Jutland took place. As is well known, before a superiority could be brought to bear, the German fleet turned away under cover of a smoke screen and a failing light, and escaped a decisive defeat. On neither side were aircraft available in any numbers, yet the action is of interest by reason of the work which the few aircraft did, and more especially by reason of the proof it provides of the imperative necessity for air work in a fleet action.

The seaplanes in H. M. S. *Engadine* were the only aircraft available for the British. One of these sent by wireless an accurate report of part of the German fleet before the action commenced—information which light cruisers could only have obtained after considerable fighting. The author believes, but does not know definitely, that during the battle the German airships patrolled to the southward of the High Sea fleet, watching its line of retreat. On the morning following the battle they did valuable work in reporting our fleet's position.

Two points are made strikingly evident by the official despatches and Lord Jellicoe's book, "*The Grand Fleet.*" The first point is the uncertainty in the C.-inC.'s mind as to the position of the enemy, after receiving a few reports from the battle cruisers; in other words, insufficient reconnaissance. The second point is that until about twenty minutes after the enemy had turned away, the C.-in-C. was unaware that they had done so, and to this their escape seems largely due. Again, insufficient reconnaissance. Any aircraft flying above the mist and the smoke might well have reported the turn immediately it was made.

After the Battle of Jutland the enemy abandoned any idea of an active policy for his Hight Sea Fleet, and concentrated on the submarine campaign. Accordingly, we greatly extended the Heligoland Bight minefields, and in connection with the mining, long reconnaissance flights from Killingholme, Yarmouth, and Felixstowe were made as often as possible by flying-boats. The chief object of these flights was to ascertain if and where the Germans were sweeping. At the end of the war the F.2A.'s were capable of patrols measuring 400 miles on the chart, but this only took the reconnaissance about half-way across the Bight, and the need for longer range aircraft became increasingly evident. This was emphasized during the last few weeks when a final sortie by the High Sea Fleet was confidently expected.

An interesting point in connection with these long reconnaissances was the difficulty of accurate navigation over the sea, and the need for developments in this direction. Obviously the more accurate the position of minesweepers reported, the more valuable the report.

Whenever the flying-boats were near Borkum, considerable fighting occurred with the German seaplanes. This led to development in flying the boats in strong formation, and of defensive armament and control of fire in the boats, which eventually enabled them to hold their own.

But to send a strong formation for each reconnaissance was most uneconomical, thus showing the need of a moderately maneuverable seaplane of high performance, which, though not intended for offensive fighting, could look after itself if attacked (A). These machines would have undertaken the work near Borkum, and the flying-boats would have undertaken the longer range work, the latter of necessity avoiding areas where opposition was likely to be very heavy. Such a machine, *Fairey* with a Rolls-Royce engine, was produced just before the armistice. There was much controversy on this subject, one school of opinion declaring that aeroplanes could do the work. It is, however, significant that those actually employed on continuous long-distance overseas flights (frequently over minefields) were emphatic that seaplanes or flying-boats, providing, as they do, more chance of safety in case of engine failure, are essential. Where the flights were less frequent and the strain consequently less, as in the Grand Fleet, the use of aeroplanes was satisfactory.

Whilst the large flying-boats, sometimes extending their radius by the use of lighters, confined their activities to the southern part of the "prohibitive area," a number of reconnaissances over the northern part, and a raid against Tondern, were made by aeroplanes from the *Furious*. The aeroplanes in light cruisers also, from time to time, had chances of attacking Zeppelins. In these operations it became evident that although the large airship falls an easy prey to an aeroplane that brings it to action, yet the action is often most difficult to bring about, because the airship can generally make a reconnaissance without coming very close, and if pursued can often escape in clouds of fog. Critics of the airship are much too prone to make capital out of the number of German airships destroyed over the North Sea (actually only six!), whilst forgetting the countless occasions on which they did valuable work without molestation.

The reconnaissances made latterly by machines from the *Furious* had an excellent effect on the morale of the Fleet's flying personnel, and in the Tondern raid gave a fine return in material damage done, but unfortunately the extent to which the minefields had now increased, put most objectives out of range. It is interesting to examine the good results which would probably have followed if more aeroplane carriers had been sanctioned along with the *Argus* in 1916, whereas actually it was nearly a year later that *Furious*, *Vindictive*, etc., were sanctioned, and at a time when there was very little more data than in 1916 regarding the capabilities of aeroplane flying off and on to ships, and when the pressure on the shipyards had increased. Had more carriers been available earlier, before the great expansion of the minefields in 1917, continuous air raids on a small scale could have been made. Their object would have been to keep the enemy occupied, to collect information, and to keep up an offensive. If the development of the torpedo aeroplane, whose possibilities were proved at the Dardanelles in 1915, had received the attention it deserved, these machines would have played an important part in such raids, which might have been developed into the landing of raiding parties on the Frisian Islands, etc. Actually, however, the enemy enjoyed complete immunity from attack on his seaboard, he was thus able to decrease his defensive measures to a minimum, and concentrate on the offensive submarine campaign. Perhaps also the earlier provision of more fast carriers would have enabled the enemy's air patrol to have been neutralized. Efforts were made in this direction with the *Vindex* and *Manxman* in the Harwich Force, but their low speed and inferior carrying capacity prevented success.

The author considers that our inability to raid the German seaboard with ships and aircraft, and the fact that until the end of the war we lacked efficient aircraft with the Fleet, handicapped us and helped the enemy (whose airships provided the aerial co-operation which we lacked)

to an extent not fully realized at the time. Had our fleet not been so handicapped the war might have been considerably shortened.

CHAPTER II

COMMERCE PROTECTION AND THE PREVENTION OF THE ENEMY'S COMMERCE

The Blockade.—To the stoppage of the seaboard commerce of the central powers, their collapse and our ultimate victory were largely due. Their stoppage was accomplished by means of the blockade, based on the right of search, which necessitated the examination of all ships entering or leaving the North Sea by the Dover Straits or round the North of Scotland.

A minefield across the Straits of Dover compelled merchantmen to enter the Downs, where examination took place, and rendered this part of the blockade comparatively simple. But the Northern Patrol was a much more difficult proposition, involving as it did the watching of a line of some six hundred miles, from Scotland to Iceland, and thence to Greenland, where the weather was of the worst and submarines were a constant menace to the patrolling ships. In June, 1918, the laying of a mine barrage from Scotland to the Norwegian coast was commenced. Primarily this was an anti-submarine measure, but it would also have helped the Northern patrol, by forcing merchantmen to use certain swept passages.

In conjunction with the plan for this barrage a considerable aircraft program was contemplated, which comprised the expansion of the existing seaplane stations in the Orkneys and Shetlands, the use of airships, and the allocation of aircraft carriers and kite ballons to the patrol. Actually the program was never undertaken, for it was realized that the long nights, the bad weather, and the great distances required to be flown rendered the work beyond the capabilities of contemporary aircraft. Had the conditions been easier there can be no doubt but that the effect of aircraft would have been great. For instance, they would have provided a most economical method of locating merchant ships and directing them to rendezvous where the searching craft would be. Again, they would have provided valuable protection for the patrol ships against submarines. In short, the great possibilities of the more efficient aircraft of the future in connection with a maritime blockade were clearly shown.

The activities of the German cruisers, such as the *Emden*, and their raiders such as the *Wolf*, merely emphasize the difficulty from which surface ships suffer in searching and patrolling, by reason of their limited speed and vision, as compared to aircraft. This amplifies the remarks made above concerning the use of aircraft in a maritime blockade. It is interesting to note that the *Wolf* used a seaplane, which is believed to have materially helped her.

Anti-Submarine Warfare—General Description.—The German submarine campaign, and our anti-submarine war, can conveniently be considered in five phases. In October, 1914, the first submarine attack on an allied merchant ship was made; later the enemy announced that all shipping in a prescribed zone round the United Kingdom was liable to attack, and in January, 1915, the first merchant ship was sunk without warning. Meanwhile, our policy had been one of attacking submarines wherever they were reported, in so far as the very limited means available would allow. By December, 1916, however, the situation had become so serious that a special organization was established in the Admiralty to deal with it, and with its establishment the first phase ended.

The main feature of the second phase was that increased efforts were made to harass each submarine from the moment of leaving the base until her return. During this phase Germany declared her policy of unrestricted submarine warfare, which virtually brought the United States into the war.

The third phase commenced with the inauguration of the convoy system in the spring of 1917, previously to which the trade had been directed by "routeing" or by "suspended sailings." It was the convoy system which, above all other methods, did most to prevent the success of the German submarine campaign, and it was in connection with the convoy system, above all other anti-submarine operations, that aircraft proved of the greatest value.

In the summer of 1917 the policy of intensively mining the Heligoland Bight began to take effect, and the fourth phase may be said to have begun. Its characteristic was the great extension of mining in the North Sea and Dover Straits. The final phase was inaugurated by the enemy abandoning his attack on merchant ships, recalling his submarines, mine-laying off our Northern fleet bases, and apparently making all preparations for a large naval engagement.

The five phases referred to apply mainly to the waters round the United Kingdom. In the Mediterranean we followed the same methods, so far as resources allowed. The work of aircraft during these phases will now be examined.

First Phase: October, 1914, to December, 1916.—During this period air stations grew up near every naval base at home and in the Mediterranean. Also a wing was sent to Flanders during the first weeks of the war, which later became based on Dunkirk. It is doubtful if aircraft contributed much towards such anti-submarine measures as were taken during this period, but experience was gained which helped greatly towards the aircraft being usefully employed when the inception of the anti-submarine division of the Admiralty led to the more vigorous measures of the later phases.

By the end of 1916 the force at Dunkirk had grown to a strength of about four wings, composed of fighters, bombers, reconnaissance and photographic machines, and seaplanes. These were used continuously over Zeebrügge and Ostend, and it was proved conclusively that seaplanes are so handicapped by the weight and head resistance of their floats, that they cannot be used where the opposition from anti-aircraft guns and hostile aircraft is very strong.

Second Phase: December, 1916, to March, 1917.—Immediately on the inception of the anti-submarine division there followed a great increase in all anti-submarine measures, and co-ordination of the methods of their employment.

At Dunkirk the R. N. A. S. was continually augmented, until at the time of transfer to the R. A. F. it consisted of a brigade. Up to the closing months of the war constant reconnaissance and bombing of the Flanders naval bases was done. This reconnaissance, which provided accurate data of the extent to which submarines used the Flanders ports, was of great value.

As regards the bombing in April, 1918, 17.5 tons of bombs were dropped, while in August this had been increased to 98.8 tons. From the evidence available it seems that the material damage done was slight, probably one submarine was destroyed in Zeebrügge docks, and in July, 1918, the lock gates at that place were probably burst. On the other hand, the enemy was forced to construct the most elaborate protection for the submarines, the constant alarms of raids must have retarded the refitting of the boats, and the effect on the crews necessitated their being sent into Germany for their leave. In addition to this, the enemy's very elaborate anti-aircraft organization must have absorbed great numbers of men and many aeroplanes, searchlights, etc., on purely defensive work.

The distinguished air officer who is best qualified to judge has estimated the relative value of the moral damage to the material damage done by the independent bombing force as twenty to one. It is probable that the effects of the Dunkirk bombers and the bombing of Cattaro were similar.

Certain it is, however, that aircraft provided the only means of attacking submarines in their bases.

All this bombing was done by aeroplanes, and therefore falls outside the strict scope of this paper. Mention has been made of it, however, because it shows where the legitimate work of seaplanes ends and that of aeroplanes begins.

Third Phase: March, 1917, to Midsummer, 1917.—The feature of this phase was the substitution of the "convoy" system for the previous system of "routeing." In the latter, merchant ships had been instructed, as far as possible, to keep clear of dangerous areas. Also trade was ordered to pass through one of the four "cones of dispersion," of which the apexes were Falmouth, Innistrahull, and Kirkwall. It was thought that the submarines would operate in these areas where the trade converged, and that it would be possible to patrol them adequately with every means available, including aircraft. However, this proved to be bad policy, for the increasing range of the submarines so magnified the cones that the controlling craft were insufficient. This led to the introduction of convoys, by which system merchantmen were collected at certain ports, and then escorted to their destination. It will readily be seen that the new system presented great advantages over the old, especially for aircraft. Patrolling a large "cone of dispersion" for a periscope was indeed searching for a needle in a haystack, but convoying ensured that the flying was done where the submarine was most likely to be, and most likely to take risks.

To co-operate in the convoy system, air-stations were built up first of all in the Channel and on the East coast, and later were extended to the Mediterranean, Irish Channel and French coast. The U. S. A. took over the convoy work in Ireland, and the Canadians made stations in Newfoundland and at the mouth of the Gulf of St. Lawrence.

The general organization was as follows: An air group was formed for each operational area. The headquarters of the group was in immediate touch with the S. N. O. and the local base intelligence office, and also in telephonic and wireless connection with the air stations or substations of the group. This provided the rapid means of communication which experience had shown as essential. As regards the equipment of such a group, this came to comprise airships, flying-boats, seaplanes, aeroplanes, and kite balloons. The functions of each of these in convoy work will now be examined.

Airships for Convoy Work.—The S.S. Airship, virtually a B.E. aeroplane stripped of its wings and suspended under a small envelope, was the first type to be used. Early in 1918 it was superseded by S. S. Z., which had greater speed, duration, bomb-carrying capacity, and facilities for observation.

The S. S. Z. was in turn being superseded by the twin S. S. This type, whilst giving an all-round increase in efficiency, had the great advantage of twin engines, and consequent greater safety in the case of engine failure or adverse winds. Further, to meet the demand for increased performance, larger non-rigids of the coastal and North Sea classes were produced but never in great numbers.

Except for the *R-29*, which helped in sinking the *U-115*, no rigids were completed in time to play much part in the anti-submarine war, but had the war gone on they would probably have done important work in escorting convoys far into the Atlantic, for which purpose large airship sheds were in course of erection in Ireland. As the submarines were gradually driven to work farther and farther from the coast, the problem of how to provide an escort when the convoy was out of range of the smaller types of surface craft and aircraft began to arise. The difficulties of flying aeroplanes from and back to a ship are so great that at present there is little chance of each convoy carrying its own aerial escort (except kite balloons), and for the future it seems that convoy work at a great distance from the coast will be the rigid airship's rôle.

The airship's greatest difficulty was that of providing adequate sheds. Finally, mooring out sites were selected for the smaller non-rigids, and this proved most satisfactory, the ships riding out gales of over 60 m.p.h. without damage.

Much criticism was levelled at the policy of employing airships. The great expenditure on the sheds was one argument, but this was largely met by mooring out. Another argument was based on the airships' inability to fly in strong winds, and although this was true in fact it was counteracted by the facility with which they flew by night or in foggy weather.

When escorting a convoy and a submarine is sighted, the airship on account of its low speed usually fails to get over the submarine with bombs before the enemy dives. Hence it is clear that the principal value of the airship is that it locates the submarine and frightens it into diving, whereupon the submarine's speed is so reduced that probably it cannot get into position to attack.

The great variation of speed facilities for observation, signalling, and accurate bombing make airships excellent for convoy work, though on account of their vulnerability this must be confined to areas which hostile aircraft do not frequent.

Very careful statistics were kept at the Admiralty of man power, etc., used up by the various anti-submarine arms in relation to the results achieved. By these the employment of airships was fully justified. In the author's opinion the only criticism that can justly be levelled is against the pre-war policy which so neglected airships.

Large Flying-Boats for Convoy Work.—The large flying-boats very early proved their value, for they had the essential qualities lacking in smaller seaplanes, viz., excellent view, good bomb-carrying capacity, big radius of action, and reliable engines.

Compared to airships the boats could fly in much stronger winds provided they had calm water for the take off. With the convoy station-keeping was more difficult, but the high speed gave a better chance of bombing a submarine before it dived. They were also capable of escort work where hostile aircraft were met; for instance, the Dutch traffic from Felixstowe.

As regards disadvantages, the F-2A suffered from extreme heaviness on controls, which was, however, largely rectified in later types. The chief disadvantage was the great requirements in sheds and slipways; but as in the case of airships this was met by the expedient of mooring out. Although this was satisfactory in modern weather, the machines were always exposed to the risk of a gale when they would almost certainly "fly" at their moorings and stave in the hulls. To render the large flying-boats really reliable when they are away from main bases where extensive slipways and sheds exist, some means of enabling them to ride-out gales in a sheltered anchorage must be found. Possibly an adjustable trailing edge by which the plans could be set to give no lift would meet the case. The author considers that this question of mooring is of great importance, and demands immediate attention (D). Some improvement was effected by keeping machines moored on lighters, but this did not entirely meet the case in really heavy weather.

Seaplanes, Aeroplanes, and Kite Balloons for Convoy Work.—Several types of seaplanes, the Short, the Wright, the Sopwith Baby, etc., were used, and all suffered from the bad view ahead, inevitable in a single-engined tractor, and insufficient bomb capacity. These disabilities, together with the fact that the seaplanes were often prevented from rising by a choppy sea, and also the necessity for reducing the number of types in production, led to the gradual elimination of the seaplane, whose inshore work was taken over by aeroplanes.

In turn these aeroplanes suffered from the same disadvantages as the seaplanes, except in the case of the Blackburn *Kangaroos*, and in addition flying over the water, even with air-bags, imposed an extra strain on the personnel, and caused extra casualties.

This leads one to the logical conclusion that the type of heavier-than-air machine required for inshore anti-submarine work, say, up to about 30 miles to seaward, is a medium-sized amphibian with floats and detachable wheels, carrying at least one 500-lb. bomb and either a pusher or twin tractor (c). Normally the machine would work from an aerodrome, but, if necessary, the wheels could be dropped, and she could alight on the sea and be capable of taxying or rising again.

Kite balloons were extensively used with convoys, for they provided the only possible aerial escort when out of flying range of the shore stations. As in the Grand Fleet there was much difference of opinion over their value, and finally the majority held the opinion that they did more harm in giving away the position of the convoy than they did good as look-outs or as "scarecrows."

Fourth Phase: Midsummer, 1917, to Autumn, 1918.—The feature of this phase was the great extension of mining and barrage work in the North Sea, the Dover Patrol, and the Straits of Otranto—the work of aircraft in this connection in the North Sea has already been described.

At Dunkirk seaplanes were originally employed for this. Their value lay in their ability to observe any change in the positions of buoys or surface nets, to act as "scarecrows" and force the submarines to dive into minefields, and to help hunting flotillas. Later the use of seaplanes had to be abandoned because they were no match for the German fighter aeroplanes, and the overseas anti-submarine work was taken over by a squadron of D.H4's with Rolls-Royce engines.

At the Otranto barrage most of the flying consisted of hunting in co-operation with the surface craft. Kite-balloons unquestionably proved their value, for, used at the extremities of the barrage area, they forced the submarine to dive before entering the area. Generally speaking, experience on this barrage led to the same conclusions as at home.

Seaplanes were found preferable on account of the reduced risk from engine trouble, but a certain number of aeroplanes were essential for weather when seaplanes could not get off, and to provide machine to get away quickly in response to urgent calls. That aircraft are a necessary part of a mobile barrage is proved. However, it was also proved that a mobile barrage is an extravagant method of using aerial and other resources, for after the Armistice it was found that the Otranto barrage had accounted for only one submarine.

Last Phase: Autumn, 1918.—General Considerations.—Of this period little need be said. The enemy abandoned the attack on merchant ships, and concentrated on submarine mine-laying off our Scottish fleet bases. To meet this all available aircraft were moved to the East Coast of Scotland and England, and employed with hunting flotillas and on patrols.

Throughout all the anti-submarine operations there was a constant demand for increased size of bombs, more accurate bombing, and better fusing. The fusing question was the most difficult, and remained unsolved at the time of the Armistice. What was required was a variable fuse, which the observer could adjust to whatever depth he required.

Intercommunication between aircraft and ships was another vitally important question. Visual signalling by Aldis lamps was proved the best, wireless only being used for long ranges. Especially abroad, however, many patrol craft carried only indifferent signallers, and in these cases dropped messages in watertight containers proved a good expedient.

Frequently aircraft failed in their attacks because a submarine heard their approach without seeing them and dived. Experiments were made to try and find a means of silencing both engine and propeller, but they met with little success, and it is hoped that the research will be continued on this most important question.

The destruction of a submarine by aircraft alone proved most difficult. Officially aircraft are credited with only twelve submarines, though the instances when they helped surface craft in successful hunts are numerous.

Undoubtedly the most effective rôle of aircraft in anti-submarine warfare was convoy work. This was proved by statistics in 1918, when of 7,000 convoys escorted by aircraft only six were attacked.

CHAPTER III

SUPPORT OF MILITARY EXPEDITIONS OVERSEAS

Dunkirk, Dardanelles, etc.—A considerable proportion of the anti-submarine work already described was in support of our numerous military expeditionary forces. However, in addition to this, certain other air work falls within the scope of this chapter, of which some of the flying on the Dover Patrol and that at the Dardanelles form the most important part.

The principal duty of aircraft, in this connection, on the Dover Patrol was to keep so close a watch on Zeebrügge, Ostend, and the eastern approaches to the Straits as to prevent the enemy's naval craft bringing off a raid in force against the cross-channel communications of the army in France. During the passage of the expeditionary force a seaplane patrol was maintained from Westgate to Ostend, and a mixed force of aeroplanes and seaplanes was sent to Belgium.

After the German occupation, however, the aircraft for the Dover Patrol were based on Dunkirk and Dover. It has already been stated that the great opposition necessitated the anti-submarine patrols and bombing being done by a squadron of D.H.4's with R.R. engines. Exactly the same conclusion was reached in the work of spotting for monitors, and reconnoitring (chiefly by photography) the enemy bases.

At the Dardanelles conditions were different. Enemy opposition was much less, calm water was nearly always available for the get-off, and hence throughout the operations seaplanes played an important part.

When the operations began in February, 1915, the only aircraft available on either side were seaplanes on H. M. S. *Ark Royal*, which were employed chiefly in locating the forts and entrenchments on the peninsula. Later, both sides were reinforced by aeroplanes, and in May H. M. S. *Ben-my-Chree*, a small seaplane-carrier of high speed arrived.

From this time onwards the presence of submarines necessitated *Ark Royal* (a ship of only eight knots) remaining in harbor. Her machines were chiefly employed in spotting for the monitors and blister ships against positions on the peninsula. This work they did most satisfactorily, their performance being quite sufficient against the limited numbers of enemy aircraft and anti-aircraft guns. Spotting for ships was gradually developed, and together with the experience gained at Dunkirk led to the following definite conclusions:

(1) The best intercommunication between 'plane and firing ship is by W. T. (but the wireless telephone gives great promise for the future).

(2) The clock system gives the best results.

(3) With these aids a ship at anchor can fire sufficiently accurately to take on counter-battery work.

(4) It is, however, risky to take on targets very close to our own troops ashore.

Value of the Fast Seaplane-Carrier.—The work of *Ben-my-Chree* exemplified the great value of a fast seaplane-carrier, used as a self-contained highly-mobile unit. Wherever aircraft were suddenly required, this ship was sent. In July, 1919, her machines were spotting for the monitor *Roberts* against the Asia batteries. During the second landing in August they assisted in a dummy landing, as a diversion, near Smyrna; and later, in the same month, effectively used torpedo seaplanes in the Marmora and Dardanelles. When Bulgaria entered the war, *Ben-my-Chree's* machines reconnoitred most of the Bulgarian coast, and were used from the Island of Milo in demonstrations against Greece. Finally,

when aerial reconnaissance of the approach to Egypt through Syria and Palestine (which were out of range of aeroplanes in Egypt) were urgently required in January, 1916, this ship was detached to the Egypt and East Indies stations. In each of these various operations it was found possible for seaplanes, judiciously employed, to compete with such moderate opposition as was found at first. The opposition invariably grew too strong later, but by this time the less mobile aeroplane units had had time to select their aerodromes, etc., and get to work. The simplicity of working seaplanes from a carrier, granted always the *sine qua non* of sheltered water, is very marked in comparison with the use of aeroplanes from an aeroplane-carrier, which must be both under way and head to wind.

Similar work was done by seaplanes in the operations on the coast of German East Africa, and also in the Red Sea, when in the spring of 1916 the Allied diplomatists were beginning to cast their flies over Mecca, and during the evacuation of North Russia in 1919. All of which proves not only the great value of the fast seaplane-carrier under certain circumstances, but also the value of the type of "fighter reconnaissance" seaplane already mentioned (see A, page 242).

Future "Combined Operations," by Navy, Army and Air Force.—Now an opposed landing on the enemy's territory (which may be termed a "combined operation") or the defence of our own possessions against such expeditions, has been a very frequent employment for the fighting forces of the Empire throughout history, and would seem to be a probable task for them in the future. Moreover, it seems that the effect of aircraft on such operations will be great. Therefore, the subject may now be considered briefly in the light of war experience and of probable developments.

Let us examine the effect of aircraft on such an expedition in its various stages. The first point is that the selection of the base or advanced base will be largely governed by the range and characteristics of the defender's aircraft. Even if his aircraft were not very strong the base could hardly be as close to the actual point of landing as were Imbros and Mudros, or all secrecy would be lost.

If, however, the defender's air force was strong, and included large airships, to ensure secrecy during the preparations and embarkation of troops the base would need to be about 1000 miles from the point of landing.

The next point is the air work during the voyage from the base to the landing. This will comprise aerial escorts against hostile aircraft, surface craft, and submarines. The relative distance between the base or advanced base and point of landing must largely decide what types of aircraft are used for these duties, and whether they work from aircraft carriers for shore bases.

The effect of the defender's air patrols might be considerable. For instance, if it was intended for the expedition to approach the coast after dark, and land by night, a machine patrolling to seaward in the previous afternoon might discover the whole expedition, and to retain any chance of surprise the attacker's air force must shoot down that machine, not merely drive it off. Probably, too, the defenders would have coastal aeroplane patrols in the evening, which would prevent the expedition approaching to very near the coast before dark, and might be a considerable handicap at a season when nights were short.

The provision of the necessary flying for covering the landing, and immediately after, presents considerable difficulties for various reasons. First because the number of aircraft carriers would pobably be limited, and there might be difficulties against keeping them under way or even anchored head to wind. Again, landing grounds ashore might be bad or even non-existent. These considerations might necessitate the use of seaplanes, providing another example of the value of seaplanes and their

carrying-ship under certain circumstances. Further difficulties are imposed by the great variety of work required, such as spotting for naval or military guns, fighting, contact work, and naval or military reconnaissance.

The great vulnerability of the beaches to low-flying aircraft, and of the large numbers of anchored transports to attack by torpedo aeroplanes, must not be overlooked.

Generally speaking, the introduction of aircraft into "combined operations" appears to favor the defender more than the attacker, as the latter's machines will probably have to work from ships, or extemporized bases, and whilst suffering from the inevitable disadvantages which such conditions impose, will have to carry out complicated, varied and difficult flying.

CHAPTER IV

THE POSSIBLE FUTURE OF THE VARIOUS TYPES OF AIRCRAFT

A forecast of the future of the various types of aircraft can only be attempted after duly weighing the various governing factors of the problem. There appear to be three factors: First, the limitations of the various types; second, the probable requirements in another war against a first-class naval power; and finally, the teachings of the late war, many of which have already been dealt with in previous chapters. On the above lines the problem will now be considered.

Limitations of Machines Heavier-than-Air and Lighter-than-Air.—The way in which machines are likely to develop in the future appears to be determined by certain mechanical facts. If heavier-than-air be considered first, the farthest that an aeroplane or seaplane can fly in still air, taking a reasonable load of bombs, guns, etc., is, to-day, about 400 miles. Now this is not improved by increasing the size of the aeroplane, because in practice the bigger the aeroplane the greater is the structural weight compared to the useful load carried; and also because the spreading of weights over the structure, which seems necessary with increase of size, causes heavy stresses when alighting. Hence, in the future aeroplanes and seaplanes appear to be limited to flights of about 400 to 800 miles, and the average speed at which they fly is at present about 110 miles per hour. (Attention is drawn to the fact that, as explained in the Introduction, "the future," unless specially stated, refers to the next ten years.)

Improvements in the motor, in constructional methods, in propellers, will doubtless cause greater efficiency, but as these are likely to be gradual improvements and not fundamental changes, the limit suggested above seems reasonable.

With the airships the conditions are different. If the ship is increased in all its dimensions in the same proportion, the volume increases as the cube, and the surface as the square, therefore to drive it at the same speed requires relatively less power. This advantage is not all lost through the fact that the stresses on each circular sector increase with the diameter. Generally speaking, then, the bigger the airship the more efficient it is, and the limits which are met first are the size of the shed, or the difficulty of mooring out a really large ship. Notwithstanding these limits, the present-day airship is capable of carrying a reasonable fighting load a distance of about 1500 miles in still air at a speed of about 60 miles per hour. In the future then, the use of the airship is for flights beyond the limits of heavier-than-air machines, accomplished at a more moderate speed and with a bigger load.

The extreme vulnerability of the airship to attack by a high performance aeroplane is another limit. At present it precludes the use of airships from localities where enemy fighters are strong, and the writer considers that probably this will remain the case in the future. The question of defensively arming the big airships demands very careful investigation, also the question of airships fighting each other.

Probable Requirements in a Future War against a First-Class Naval Power.—Having defined the fundamental limits of the two main classes of aircraft it is appropriate next to consider whether the requirements of a future war against a first-class naval power are likely to differ from the late war.

A little reflection leads to the conclusion that we are most unlikely to find ourselves placed in so favorable a strategic position as in the late war, with the British Isles situated across the arteries of the sea communications of our enemy.

Again, in the late war the main bases of the opposing fleets were separated only by some 500 or 600 miles. Is this likely to occur again? On the contrary, it is far more probable that this distance will be greatly extended, and the key of the naval situation instead of being the control of the North Sea may be the control of a great ocean. Or it is possible that the enemy's fleet may be so distant that before naval operations on a large scale can begin, our fleet will have to move to bases situated nearer the enemy, whilst our trade and possessions within striking distance of the enemy's fleet are protected as much as possible in the meantime by local resources.

Another consideration is that the increasing use of aircraft in naval warfare will have the effect of forcing fleets to move at night or under water if they are to be unobserved, in the same manner as troop movements are nowadays made in darkness, or with great attention paid to concealment and camouflage.

What, then, are the inferences to be drawn from the difference between the probable requirements of the future and those of the late war? Obviously we cannot be content with ranges and performances which would have suited the North Sea. There must be no slackening of effort to produce aircraft with greater radius of action, greater speed, and greater all-round efficiency. Night flying and anti-submarine work must continue to be developed. Also the possibility of the Admiralty calling upon the independent air force to endeavor to secure aerial supremacy over a specified part of the ocean during any big fleet movement should be recognized. The possibility referred to above of distant possessions and maritime trade being protected by local resources pending the arrival of our fleet (which would probably take several months) opens up great possibilities for aircraft. Aircraft would be invaluable as part of these local resources—their use in defence against invasion has been emphasized in Chapter III.

The rapidity with which aeroplanes can get to Australia forms a striking contrast to the time it would take our fleet to reach the Pacific should its presence there be necessary. When once the Empire's air routes are developed, a powerful air force from some central position, such as Egypt, could be sent to any threatened possession long before the fleet could arrive.

If imagination is allowed to take us somewhat beyond the ten years by which the writer defines "the future" for the purpose of this paper, it is not difficult to visualize the Air Force undertaking some of the present functions of the fleet, transporting expeditions to enemy countries by air, arriving rapidly to reinforce beleaguered garrisons, or fighting a campaign against merchant shipping with large numbers of torpedo-carrying aircraft. Indeed, the imagination leads us into a veritable Abdullah's Cave of strategical possibilities. We are led, perhaps, out of the scope of this paper—co-operation with the navy—into the sphere of independent air strategy. But in an age when the rapidity of communications and transportation continues to increase, a contemporary speeding up of warfare is inevitable, and such possibilities for the more distant future must be recognized. By recognizing them we can ensure that aerial development in the immediate future, and the development of imperial strategy, progress

along lines which will eventually enable air power to be a safeguard to the Empire.

To return, however, to the question under consideration. Another point which should be borne in mind before trying to predict the future uses of aircraft, is that in the late war machines designed for work with the army were produced in much greater numbers than those for the navy. Therefore, it was often good policy to adapt a primarily military machine to naval use, because only by reducing the number of types could sufficient production be maintained. But in the next war the opposite might be the case, and therefore in peace time the provision of makeshift machines for naval purposes should be avoided.

Subject to the various considerations enumerated in this Chapter, some prediction of the future of the various types of aircraft for sea reconnaissance and co-operation with the navy will now be attempted, and aircraft from ships at sea will be dealt with first.

Aircraft in Fighting Ships.—In a modern fleet the writer considers there should be special aircraft-carriers and also aicraft in certain fighting ships.

Each light cruiser should carry a machine, either a single-seater fighter or a two-seater reconnaissance machine, so allotted that there was one of each type in each pair of light cruisers. The rôle of the fighters would, of course, be keeping down all enemy machines. The reconnaissance machine was not part of our Grand Fleet program during the war, but as so much of a light cruiser's work is reconnaissance there can be little question that they would be most valuable, and it should be possible in the future to produce a suitable two-seater for this work. Wireless telephony will probably prove a most useful means of communicating with reconnaissance machines, and also with spotters.

As regards the battleships and battle cruisers. Each, it is thought, should carry at least one two-seater for spotting and at least one fighter. This would ensure that each squadron of ships had its own quota of spotting planes and fighters to protect them. Also it would avoid the complications and the anxiety to the flag officer commanding the squadron which there would be, if machines from a special aircraft carrier accompanying the squadron carried out these duties. In future it may be possible to produce a three-seater for spotting; if so, it would be a great advantage to have a gunner in addition to the pilot and observer. The author considers that spotting, and reporting enemy movements in a naval action is too difficult for the pilot alone to do, and this necessitates the passenger (if only one is carried) being primarily an observer.

Aircraft in Carriers.—Now as regards the aircraft carriers. It is impossible to lay down any definite proportion of these to the other classes of ships, since this must depend on the composition of the adversary's fleet and the nature of the battle it is expected to fight. But it is possible to predict the types of machines to be used from the carriers. These ships should work directly under the commander-in-chief (except, perhaps, one or two under the flag officer commanding the most advanced light cruisers or battle cruisers), and should be stationed within visual signalling distance of him, if possible. They should carry fighters to enable aerial supremacy to be obtained at any given time and over any particular area should the commander-in-chief wish it; also torpedo machines, bombers and reconnaissance machines, all working directly under the commander-in-chief. It is quite clear that this will necessitate there being a considerable number of aircraft carriers in a modern fleet, and that the number of carriers should be greater in proportion to the surface craft than was the case in the Grand Fleet in the late war.

Another use for the fighters will be low-flying attacks on ships, particularly destroyers whose personnel is so exposed. A determined low-flying attack on a flotilla by a squadron of fighters might easily prevent a destroyer attack being pressed home.

The carriers generally should be large ships, but a certain number of small ones (probably without landing-on decks) will be necessary for operations with light forces, like the Harwich force in the war. Apart from the value of carriers in a fleet action, they will be useful for minor offensive operations against objectives which are beyond the reach of aircraft from shore bases.

Then there is the question of whether the machines carried in fighting ships and in carriers should be aeroplanes, or seaplanes with wheels for flying-off and capable of being dropped. The author considers that if seaplanes can be produced to fulfil the necessary flying-off conditions from the fighting ships, and in addition the necessary alighting conditions in the carriers, and also have the required performance in the air, they should be used. Obviously the fighters must be aeroplanes, but in the future the spotting machines and perhaps those for reconnaissance might be seaplanes. With the seaplanes the strain on the personnel and the wastage would be much reduced. Also, wherever the fleet went in peace time the machines could make daily practice flights, weather permitting, irrespective of whether there was an aerodrome near by or not, and of whether the fleet was at sea or in harbor. There will also be special uses for seaplanes from seaplane-carriers, in combined operations and minor operations, as explained in Chapter III.

Aircraft from Shore Bases.—From shore bases the future of the airship is to work beyond the range of heavier-than-air machines, or in localities where hostile fighters are weak or neutralized. Fleet reconnaissance, patrols, anti-submarine work, bombing and reconnaissance of enemy ports, and perhaps mine-laying will all be part of the airship's duties under these conditions.

The same duties will be carried out at shorter ranges by heavier-than-air machines. Here, again, the question of seaplane or aeroplane arises, and the answer, the writer considers, is the same, viz., where the performance which is required permits, use a large flying-boat if a big machine is wanted, or a seaplane (fitted with wheels and flown off an aerodrome if sheltered water is not available) if a smaller machine is wanted. The writer considers that small flying-boats have no future, as experience has proved that they are so easily swamped.

But if the employment necessitates a very high performance an aeroplane must be used; for instance, the amphibian suggested (see C, page 248) would be suitable for anti-submarine work if there was little opposition, although for similar work or reconnaissance on a strongly-defended hostile coast, everything else should be sacrificed to performance, and an aeroplane used.

In addition to the duties enumerated, heavier-than-air machines would be most valuable for attacks against an attempted landing, as already explained. In such operations, and for attacks on ships in harbor the torpedo machine has a great future. These machines should be developed on two lines, the small handy machines (particularly suitable for work from ships) to attack at close range, and large machines for attack at longer ranges, requiring less maneuverability. For the latter work the flying-boat is believed to have already been found suitable. With the advent of the improved mooring-out capabilities suggested (see D, page 248), it is easy to visualize a squadron of torpedo-carrying flying-boats working like a destroyer flotilla of to-day.

In all aspects of overseas flying the difficulty and importance of accurate navigation is very great. Too much attention cannot be given to this question. At present directional wireless seems the most promising method.

Conclusion.—Finally, it is only necessary to add that whereas in the late war aircraft gradually became valuable in nearly every branch of naval warfare, study leads to the conclusion that in the next war against a first-class naval power the use of aircraft will be very greatly extended.

Consequently, to a naval power which now develops aerial co-operation with the fleet, largely and on sound lines, aircraft are a vast accession of strength. But to a nation which fails to do this they are a most serious danger.—*The Journal of the Royal United Service Institution*, May, 1921.

THE ACTUAL STATE OF THE HELICOPTER PROBLEM.—The helicopter problem has again been brought to the general attention by a few attempts made in different countries to realize such flying apparatus. For this reason a few competent remarks on the actual state of this problem would be at present not without interest.

The *helicopter* is understood to be a flying apparatus where the lift is derived from rotating blade-screws.

A helicopter, in order to actually fly, must not only be able to lift itself but must also be fully *stable* and *manoeuverable*, and in addition, must be able to safely reach the ground in case of the stoppage of the motor. A clear idea of how the helicopter will behave when free to move in space must first be gotten before the requirements of design can be met. I will give a short survey of these different sides of the question.

I. *The Lifting Problem.*—The present state of the blade-screw theory is such that it is not difficult to design and build helicopter screws that can secure a very high lift, and the difficulty in the realization of helicopters is not at all in this problem. In Fig. C is given a general picture of the thrusts per horsepower than can be secured by helicopter screws. This figure has been established for a first checking and must be considered as giving rather an underestimate of what can be really realized; which means that the data here furnished shows only the minimum of what can be expected from a helicopter-screw and by a careful design these performances can be easily exceeded. As abscissae, are plotted the helicopter screw diameters and as ordinate, the thrust per horsepower. The two systems of curves give the corresponding total horsepower and numbers of revolutions per second. For example, a helicopter-screw absorbing 10 h. p. and having 6 meters in diameter will be able to furnish 10 klg. thrust per horsepower when turning 2 revolutions per second. This means that the total thrust would be 100 klg. for the 10 h.p. If for the same power the diameter of the helicopter-screw would be reduced to 4½ meters then at around 3 revolutions per second, such blade-screw would give us only 8 klg. per horsepower, that is, 80 klg. for the whole power. One can see how easily any power or size relation concerning helicopter-screws can be answered by this diagram and that helicopter-screws when properly designed can with ease furnish the thrust necessary to lift a helicopter with its powerplant and pilot. The data used in the establishing of this diagram are of such reliability that they illustrate the relations which hold in the present case with great accuracy. I will mention here that several blade-screws built and tested by the author have more than justified the data here furnished.

A point of interest is, that it is easier to get a high lift per horsepower from a smaller power blade-screw than from a higher power one. The helicopter-screw must only make a number of revolutions appropriate to power and diameter selected in order to work in efficient conditions. The study and discussion of all such subjects as helicopter-screw efficiency and general method of the design will be found in the author's Blade-Screw Theory above mentioned. The general conclusion to be drawn is: With the knowledge actually available helicopter-screws securing the necessary lift can be built with ease. The foregoing diagram is here given to justify this opinion. It is only ignorant inventors who think the whole helicopter problem consists in the building of the lifting screws, although they usually do not even reach so far. It is necessary to bring attention to this state of this question. It must be remembered that the blade-screw problem is one of the most difficult problems of modern aerodynamics and no one can

hope to familiarize himself with it in a few days. But those at the level of the present state of knowledge and experience on this subject know well that there is nothing to invent in order to build a helicopter-screw giving a high lift.

II. *The Problem of the Descent When Motor is Stopped.*—Insofar as is known to him, the author was the first to investigate the blade-screw problem in such generality as to discuss all the possible states of work of a blade-screw and among which the brake state is to be found. The situation stands thus: Different brake states are possible for a blade-screw. Two of these brake states which I call the first and second brake state require that power is applied to the blade-screw in order to get the braking action. These brake states can thus not be used in the helicopter case. The third brake state is, exactly speaking, the turbine or wind mill case. Usually a wind mill is used as a generator. But, as well known, the wind mill when working produces an axis thrust which is usually balanced by proper bearings. But in the helicopter case, when the motor stops and the helicopter is obliged to descend it is possible to make its blade-screws work as wind mills and simply use the axial thrust thus produced to brake the descent of the helicopter. In order to reach this result it is only necessary to design the helicopter screws so as to secure a high braking action of the kind above explained and that a proper resistance be provided to be overcome by the helicopter screw when rotating as a wind mill. Under such conditions the same helicopter screws which secure the lift of the apparatus when the motor power is furnished to them, will secure the descent, when motor is stopped, working as wind mills, the power being absorbed by a special device. Thus one must not think that the helicopter will simply drop down if its motor stops, but its blade-screws are able to secure the descent if properly designed. For all qualitative relations referring to the braking action of blade-screws, the reader is referred to the author's "Blade-screw Theory," especially its Chapter II. The figures A and B of this chapter give a general picture of all the states of work possible for a blade-screw and the relation of the lifting state of work (marked 1 in figure B) to the wind mill braking state can easily be seen (marked 4 in figure B). In the question of slowing down of the descent of the helicopter, there is in principle nothing to invent but only to use properly the knowledge available.

I apologize for having to refer so much to my own investigations on the subject but I do not know of any other investigations which have treated especially this braking action of the blade-screws, with the necessary generality.

III. *The Behavior of a Helicopter When Free to Move in Air.*—I think it will not be without interest if I will explain a little in detail as to what will be the general behavior of a helicopter, when it has hopped off and is left free to move in the atmosphere.

I will first mention that it is quite a naive idea to imagine that the helicopter will rise and fall exactly vertically through the point of its start. The trouble is that most usually we have winds in the atmosphere and once a helicopter has hopped off, it will be immediately carried away by the wind in the same manner as a spherical baloon. If we would like to have the helicopter remaining nearly over the place of start, we must equip our apparatus with the means of propulsion able to communicate to the helicopter a translational speed equal and opposite to the wind speed. It is only if the helicopter will be able to move against the wind with the speed of the wind that we will be able to keep an apparatus over the place from which we have started. We thus see that if we do not want the helicopter to be carried away by the wind we must secure its propulsion at the speed of the wind. The magnitude of the wind speed fixes the lower limit of the horizontal velocity that a helicopter must be able to develop. If we want the helicopter to be able to travel, as we certainly do, we must

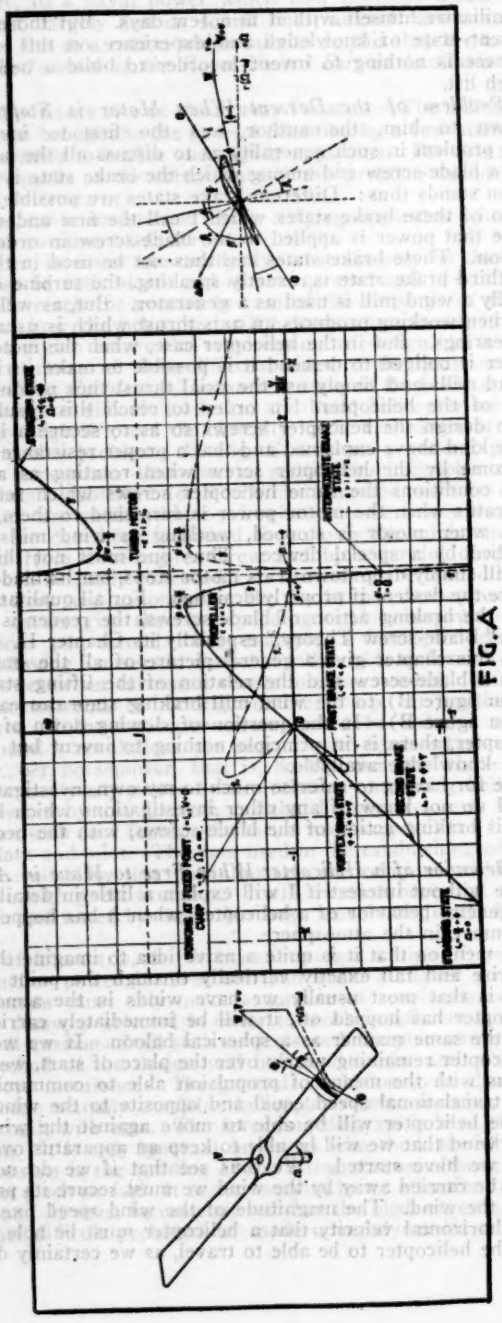
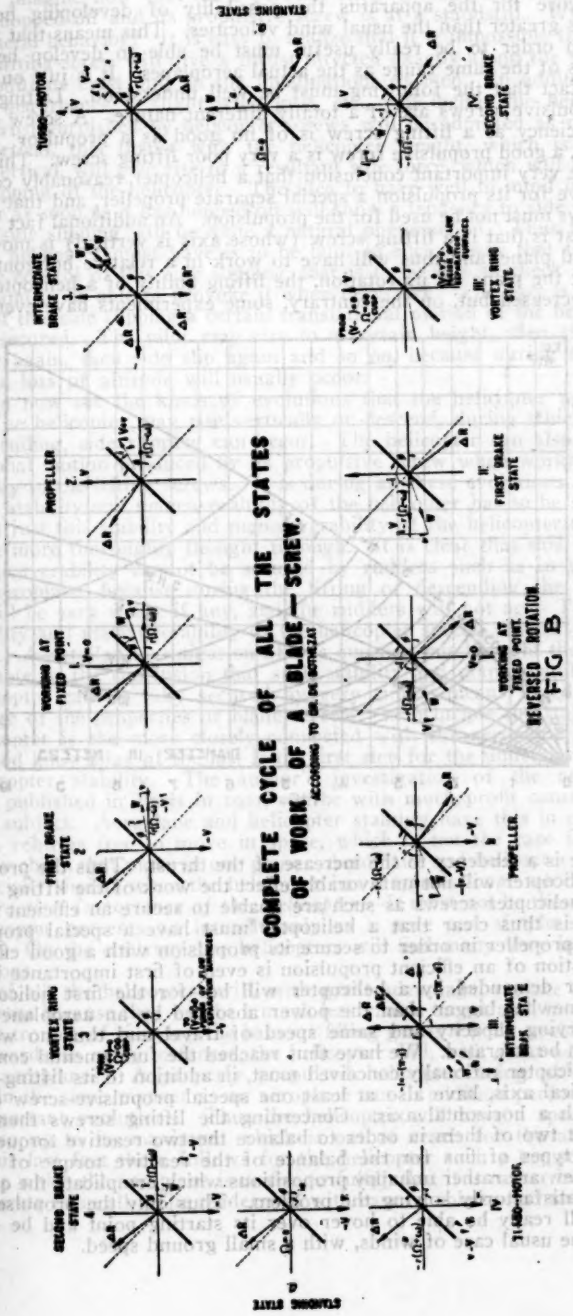


FIG. A



COMPLETE CYCLE OF ALL THE STATES OF WORK OF A BLADE—SCREW.

ACCORDING TO DR. DE BOTHEZAT

FIG B

even secure for the apparatus the possibility of developing horizontal velocities greater than the usual wind velocities. This means that the helicopter in order to be really useful must be able to develop horizontal velocities of the same range as the actual aeroplanes. It is just on account of this fact that the following must be well understood. Lifting screws and propulsive screws are of a totally different nature. A screw giving a high efficiency as a lifting screw is of no good as a propulsor. On the contrary, a good propulsive screw is a very poor lifting screw. This brings us to the very important conclusion that a helicopter reasonably conceived must have for its propulsion a special separate propeller, and that the lifting screws must not be used for the propulsion. An additional fact in favor of the last is that if a lifting screw (whose axis is vertical) is moved in a horizontal plane, and thus will have to work in a relative horizontal wind sweeping the plane off its rotation, the lifting ability of a helicopter-screw is not decreased but, on the contrary, some experiments have even shown

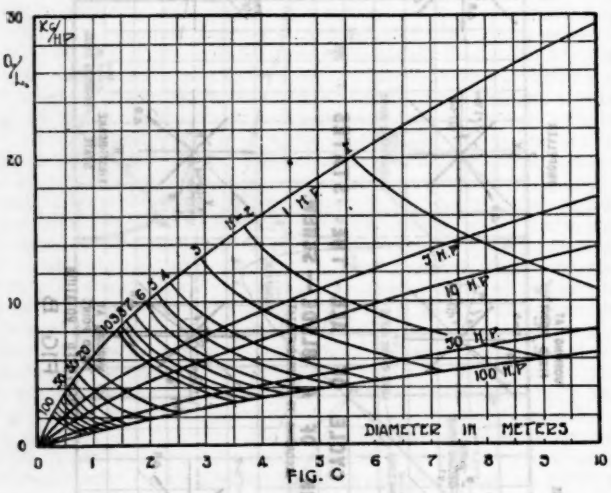


FIG. C

that there is a tendency to the increase of the thrust. Thus the propulsion of the helicopter will not unfavorably effect the work of the lifting screws. But the helicopter screws as such are unable to secure an efficient propulsion. It is thus clear that a helicopter must have a special propulsive-screw or propeller in order to secure its propulsion with a good efficiency. This question of an efficient propulsion is even of first importance because the power demanded by a helicopter will be—for the first helicopter at least—somewhat bigger than the power absorbed by an aeroplane of the same carrying capacity and same speed of travel and thus no waste of power can be tolerated. We have thus reached the fundamental conclusion that a helicopter rationally conceived must, in addition to its lifting-screws with vertical axis, have also at least one special propulsive-screw or propeller with a horizontal axis. Concerning the lifting screws there must be at least two of them in order to balance the two reactive torques. All proposed types of fins for the balance of the reactive torque of a helicopter-screw are rather unhappy propositions which complicate the question without satisfactorily solving the problem. Thus only the propulsed helicopter will really be able to hover over its starting point and be able to land, in the usual case of winds, with a small ground speed.

Let us imagine now that on a perfect, still, windless day a helicopter has just hopped off and its propulsive screw is at a standstill. What will be its general behavior? It is easy to realize that it is impossible to expect that the lifting-screw will give a thrust directed exactly along the vertical. Ideal conditions exist only in the imaginations of men. In addition, the slightest disturbance, a slight wind gust, etc., will incline the helicopter. If the thrust furnished by helicopter-screws will be admitted as not perfectly vertical, this thrust with the helicopter weight, which is always exactly vertical, will give rise to a resultant side force, which will produce a side slipping of the helicopter. The idea to have well in mind is that a helicopter as soon as it has hopped off will show a tendency to side slipping and this side slipping will be quite a natural phenomenon. Thus the first quality a helicopter must have is to be built in such a way that the pilot may have control of this side slipping, that is to be able to check it when it starts and to be able to provoke it when necessary. The fact is that by the aid of this side slipping a certain translational motion of the helicopter may be secured. The pilot may rise to a certain height, then side slip, then rise again, then side slip again and so on, because during the side slipping a loss of altitude will usually occur.

We can now see the kinds of evolutions that the helicopter may perform. The helicopter may rise vertically or descend, during which rising and descending, side slipping can occur. The helicopter can also have a translational motion produced by its propulsive screw when working simultaneously to the lifting screws. It is during all these evolutions that the complete stability and maneuverability of the helicopter has to be secured. And it is just this stability and manœuverability of the helicopter that has to be the more thoroughly thought through. It is clear that this stability and manœuverability cannot be secured by rudders such as in the case of the aeroplane, because during the lifting or descending the relative winds will be very weak, if any, and the rudders will not act. Thus, for the stability and manœuverability of the helicopter special devices must be provided. A detailed investigation of this question has brought the author of this note to the conclusion that such stability and manœuverability of the helicopter can be fully secured by very simple means based on the knowledge of the properties of blade-screws. In principle the stability of the helicopter is the more closely connected with the aeroplane stability and a good knowledge of the last is the first step for the understanding of the helicopter stability. The author's investigation of the aeroplane stability, published in Paris in 1911, can be with much profit consulted on this last subject. Aeroplane and helicopter stability have this in common, both are vehicles free to move in space, which is not the case for ships and automobiles that move in one plane. Aeroplane and helicopter stability are especially similar when the helicopter has a translational velocity.

IV. *Practical Importance of the Helicopter.*—It must not be thought that the helicopter presents an interest only as a pure and simple scientific curiosity. On the contrary, the helicopters will find many very important applications.

First of all, the helicopters will, with great advantage, replace observation baloons because they will be a much less visible target and, in addition, the great trouble of carrying the baloons filling gas is wholly avoided.

Afterwards, in many instances, the helicopter will, with great advantage, replace aeroplanes. A properly propulsed helicopter being able to fly quickly in the same manner as an aeroplane can in addition perform other very important evolutions. Thus the helicopter will have a speed range from zero up to its maximum which is out of reach for the aeroplane. From this last fact there follows for the helicopter such a big set of applications which the aeroplane is unable to fulfill, that it is rather impossible to enumerate them all. The reader will with ease be able to find such applications.

The realization of the helicopter must thus be considered a very important step in the progress of aeronautics.

I hope this short survey will give a general idea as to how the helicopter problem stands. Actually we have all the necessary knowledge on hand in order to build a helicopter, and such an apparatus can be built, even with small expense, in a rather short time. Even no preliminary tests are necessary so clear are all the relations that hold in this case. If the helicopter has not been realized until the present, it is only because those who have the facilities and possibilities to do it are usually ignorant on the subject. The usual helicopter inventor thinks that the entire problem is in securing the necessary lift. He concentrates all his attention on the last and because he is totally ignorant about blade-screws, is unable to even reach so far. If the building of helicopters would have been left to men of knowledge on the subject, it would have been long since realized.—*The Aerial Age Weekly*, May 23, 1921.

MISCELLANEOUS

DUTCH OIL, LUBRICANT AND IRRITANT.—Oil has a persistent way of "seeping into political discussion, as witness the cases of Mexico, Colombia, and Mesopotamia," remarks the Rochester *Times-Union*, as it views the international fight for control of the world's oil resources. Far-off Sumatra is now brought into diplomatic discussion through the State Department's protest to the Dutch Government against the exclusion of American oil interests from Sumatra and other Dutch East Indian islands. The note, says the Washington correspondent of the New York *Times*, "is merely another step in the vigorous prosecution of a very definite and fixed policy of the Harding Administration in opposition to the monopolization of the oil resources of the world by any foreign interests in any manner that involves discrimination against American capital or peril to valid American interests." The keen international rivalry which now exists, points out the Rochester *Post-Express*, "is not a struggle merely for the money profits in oil production, but a battle for world trade, commercial supremacy, naval dominance, and the control of the air, for control of a great part of the world's supply of oil could bring these things." Besides, as the Chicago *Tribune* points out, "the owners of some seven and a half million motor-vehicles in the United States are keenly interested in the future supply of oil and gasoline."

Secretary of State Hughes reminds the Dutch Government that "Dutch capital has had free access to American oil deposits," and a similar privilege for American interests in the Djambi fields of the Dutch East Indies is demanded. His note, which the American Minister handed to the Dutch Government, says in part:

"I have pointed out that the United States has for years carried a burden of supplying a large part of the petroleum consumed by other countries, and that the petroleum resources of no other country have been so heavily drawn upon to meet foreign needs as the petroleum resources of the United States. I have pointed out that in the future ample supplies of petroleum have become indispensable to the life and prosperity of my country as a whole, because of the fact that the United States is an industrial nation in which distance renders transportation difficult, and agriculture depends largely on labor-saving devices using petroleum products.

"In these circumstances, my government finds no alternative other than the adoption of the principle of equally good opportunity, with the proviso that no foreign capital may operate in public lands unless its government accords similar or like privileges to American citizens; and, furthermore, I have submitted that in the light of the future needs of the United States such very limited and purely defensive provisions as the above might

become inadequate should the principle of equality of opportunity not be recognized in foreign countries."

Thus the note makes it clear that "if American capital does not receive equality of opportunity with other foreign capital in the development of the oil resources in various parts of the world, there will be vigorous reprisals on the part of the United States," is the way another writer puts it. "It is not the function of the government to become the partner of any interests searching for oil concessions, but it is the government's proper function to insist on the 'open door' in lands controlled by foreign governments," maintains the Brooklyn *Eagle*, and the Columbia (S. C.) *Record* agrees that "it is hight time that the United States Government put its weight and influence behind American oil companies, for oil is rapidly replacing coal as a fuel for ships."

It was the Netherlands lower house that denied to the Standard Oil Company of New Jersey the right to obtain concessions; the upper house has yet to act. The vote, in the opinion of the Washington *Herald*, "represents a victory for the Anglo-Dutch concerns....in which a number of ex-ministers and former members of the (Dutch) Chamber are interested." Not only are principal Dutch oil companies "partly British, but they are British-government-owned, which makes the matter all the more serious from the political as well as the economic standpoint," asserts the Denver *Rocky Mountain News*. "British political interests find it convenient now and again to put forward a Dutch organization instead of a purely British one," significantly adds this paper, and it goes on:

"The British Government is in the oil business directly and indirectly. The government is shareholder in several of the giant oil-producing corporations. Besides, the government is spending many millions securing and policing oil territories in the ear East. Indian and British armies are employed for the purpose."

"The Dutch Government apparently has played fast and loose with our Minister, and it should now clear up its ambiguous attitude toward the admission of American capital and also refute, if possible, the charge of admitting British capital secretly to the development," declares the Mobile *Register*. "The note makes it clear that the United States demands nothing which it is not willing to grant to any other country," we are reminded by the Chicago *Daily News;* but "Holland and Great Britain appear to have arranged an oil alliance, and it is against this discrimination that the Hughes note protests," explains the St. Louis *Post-Dispatch*. As we read in the New York *Herald:*

"What the Dutch and English governments have neglected to say, but what is really at the bottom of the oil controversy, is that Englind has, in the words of one of her own financial authorities, 'got her claws on the future oil supply of the world and she intends to keep them there.' It is not the present supply or distribution of petroleum about which England is concerned, but a monopoly of the future supply and distribution after the oil resources of the United States, so heavily drawn upon to-day, shall have been exhausted. Then American companies will be out of the running and American industries, automobiles, airplanes, and merchant and naval ships will obtain their supplies of oil at a price and in a quantity to suit the convenience of foreign producers in a virtual monopoly."

In reply to the charges of discrimination, which it denies, the Dutch Government tells us that when competition for the oilfields in the East Indies was free to all companies several years ago, American oil concerns displayed no interest whatever.

Moreover, we are reminded in the New York *Journal of Commerce* of some of our own sins:

"Our shipping policy is discriminating, and our immigration limitations as well as various less familiar elements in the Federal policy all run counter to the ideals of internationalism which seem to lie at the root of the note to Holland. We can not be international where American foreign

trade is concerned and national where the foreign trade of other countries is at stake. It will require the exercise of very great diplomatic ingenuity to present our case in such a way as to offset this outstanding fact in the situation."—*The Literary Digest*, May 21, 1921.

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Effect of Temperature and Specific Gravity on Storage Battery Operation. *Power*, May 24, 1921.

Atmospheric Disturbances, or Static, in Radio Telegraphy. *The Journal of the Franklin Institute*, May, 1921.

The Scientific Control of Combustion. *Engineering and Industrial Management*, May 12, 1921.

Submarine Warfare. *The Journal of the Royal Artillery*, May, 1921.

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Must We Fight Japan. A Review of Prof. Pitkin's book. *National Service*, May, 1921.

Twenty years of Marine wireless. *The Nautical Gazette*, May 21, 1921.

Determination of Position of Aircraft by Radio. *Flying*, June, 1921.

Aluminum and its Alloys in Engineering. *The Engineering*, May 6, 1921.

Recent Improvements in Steam Turbine Design. *The Engineer*, May 6, 1921, *et seq.*

Pneumatic Transmission of Messages on Warships. *Engineering*, May 6, 1921.

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Aeroplane Superchargers. Translated from the German. *Aerial Age Weekly*, May 30, 1921.

NOTES ON INTERNATIONAL AFFAIRS

FROM MAY 10 TO JUNE 10

PREPARED BY

ALLAN WESTCOTT, Professor, U. S. Naval Academy

GERMANY AND ALLIED POWERS

GERMAN REPARATIONS PAYMENTS.—Complying with the terms of the Allied ultimatum of May 5, Germany on May 30 completed her initial reparations payment of one billion gold marks by turning over to the Reparations Commission in Paris the equivalent of 160 million gold marks in currency, and presenting German treasury bonds for the remainder. These bonds were twenty in number, each for about $10,000,000, and maturing within three months. The first two were paid as they fell due early in June. Germany's plan of taxation to cover reparations payments includes mortgages on 20% of all real estate at pre war value, and also a 20% government share in all business enterprises.

WIRTH CABINET ORGANIZED.—Following his appointment as head of the German Cabinet at the time of the reparations crisis in early May, Chancellor Wirth encountered difficulty in filling portfolios and securing parliamentary support. For the time being, he assumed the post of foreign minister. On June 5 the Reichstag gave a vote of confidence of 213 to 77 (48 of the German People's Party not voting.) The majority came from the three parties composing the government coalition—Centrists, Majority Socialists, and Democrats—supported also by the Independent Socialists. Without votes from the parties of either the right or the left wing, the three-party coalition hardly supplied a safe working majority.

TRIALS OF WAR OFFENDERS AT LEIPSIC.—Trials of Germans accused of crimes against established laws and customs of war, as called for by the Versailles Treaty, began at Leipsig in June. Three of the accused were convicted and given varying sentences. Lieut. Neumann was acquitted on the charge of sinking a British hospital ship, on the ground that he was obeying the orders of his superiors.

ALLIED CONTROL IN SILESIA

NEUTRAL ZONE ESTABLISHED.—As a means of stopping hostilities in Silesia, France and Great Britain in early June agreed upon the policy of establishing a neutral zone between the parts of Silesian territory occupied respectively by German and Polish irregular forces, the neutral zone to be held by British and French troops. No final allotment of the disputed districts was to be made until hostilities ceased. In execution of this policy, British troops were despatched to Silesia, the first detachments arriving about June 1.

Speaking in parliament on May 13, Premier Lloyd George declared himself strongly for "fair play" toward Germany in the Silesian difficulty, saying that either Allied troops should be used to prevent the Poles from unwarranted seizure of territory, or the Germans should be allowed to defend themselves. He held Poland responsible for the activities of irregulars under General Korfanty.

Premier Briand, defending his foreign policies in the French Chamber, received on May 26 a favorable vote of 403 to 163. The French premier opposed the British plan for an immediate meeting of the Supreme Council at Boulogne to discuss Silesia. Instead it was decided that the authority of the Interallied Commission should first be reestablished in the territory under dispute, and an additional commission appointed to settle boundaries. On May 28 an armistice was negotiated between the German and Polish factions.

AMERICA REFUSES INTERVENTION.—To a long appeal from Poland for American assistance in the Silesian affair, Secretary Hughes on May 18 made public the following answer:

In reply I have the honor to inform you that, in my opinion, the settlement of such boundary disputes as arise in the case under consideration is a matter of European concern, in which, in accord with the traditional policy of the United States, this government should not become involved. The attitude of the government in this matter is clearly understood by its representatives in Europe, who will, therefore, as far as at present may be seen, take no part in the discussions concerning Upper Silesia, and will express no opinion as to the settlement.

LEAGUE OF NATIONS

COL. HARVEY CONDEMNS LEAGUE.—In a speech at a dinner in his honor given by the Pilgrims on May 19 in London, Ambasador Harvey interpreted American foreign policy in a manner that attracted general attention. He declared that while, in the words of President Harding, the United States would "play its full part in joining the peoples of the world in pursuit of peace," it would not be "beguiled into the League of Nations." Col. Harvey announced at the same dinner that he had been authorized to attend the meeting of the Supreme Council, if one were held to discuss Silesia.

AMERICAN PLAN FOR A LEAGUE.—According to press reports at the close of May the policy of the American Government was tending to favor an association of nations to be developed out of the present Supreme Council of the Allied Powers, supplemented by an international court of justice. It was stated also that informal inquiries regarding an international conference on reduction of armaments had already been made by Ambassador Harvey.

PROGRAM FOR LEAGUE COUNCIL.—Geneva, June 6 (Associated Press).—Amendments to the covenant of the League of Nations, mandates, the Polish-Lithuanian dispute, settlement of the Aland Islands question, and the protests of Germany against the presence of French troops in the Sarre Basin and of Poland against the decisions of the High Commissioner in Danzig regarding the maintenance of Polish troops in the port will take

up a great part of the approaching session of the Council of the League.

Dr. V. K. Wellington Koo of China will make a report on the Sarre administration, with special reference to Gergany's complaint concerning the use of French money to pay the miners, as well as the garrisoning by French troops.

Viscount Ishii of Japan will present a report on the terms of Class B mandates, and M. Hymans of Belgium will report on the Class A mandates. It is understood these reports will concern only the terms under which the mandates shall be exercised, and will not relate to the question of the allocation of the territories, including the Island of Yap, subject to mandates.

Arthur J. Balfour, Chairman of the Special Amendments Commission, will present its report on amendments to the covenant, with the draft of the notice to the forty-eight members of the League concerning the proposed amendments to be voted on at the September meeting of the Assembly of the League.

The Secretariat of the League of Nations has received from the Hungarian Chargé at Berne a formal application for the admission of Hungary to the League. The application will be placed on the agenda of the Assembly, which will meet in September.—*N. Y. Times,* July 6, 1921.

ARMAMENT COMMISSION MEETING POSTPONED.—The meeting of the Armament Commission of the League of Nations, scheduled to meet at Geneva on June 10, was postponed until July 10 and shifted to London.

GREAT BRITAIN AND IRELAND

RESULTS OF IRISH ELECTIONS.—The election to the Southern Parliament of Ireland, held on May 12, resulted in a complete victory for the Sinn Fein. There was no polling, since there were no opposition candidates. Of the 128 seats all but four (for Dublin University) were filled by Sinn Feiners. Of the new members more than half are now imprisoned, and since none will take the oath of allegiance, the parliament will not function, and the viceroy must either organize a provisional government or put all Southern Ireland under martial law.

In Ulster the elections resulted in the choice of 40 Unionists, 6 Nationalists, and 6 Sinn Feiners. At the formal opening of the Northern Parliament on June 7 the Sinn Feiners and Nationalists did not appear. Premier Sir James Craig was first to take the oath of office; R. W. H. O'Neill was elected speaker. It was expected that King George, and possibly Premier Lloyd George, would be present at the state opening on June 21.

BRITISH IMPERIAL CONFERENCE.—An Imperial Conference of Premiers of British Dominions and Colonies was scheduled to meet in London on June 22, the problems to be considered including naval support, the Anglo-Japanese Treaty, trade and political relations between the mother country and the dominions, and an imperial constitution. President Butler of Columbia was invited to address the conference.

AUSTRIA.

PLEBISCITES FOR UNION WITH GERMANY.—An unofficial plebiscite held in the province of Salzburg on May 29 resulted in an almost unanimous vote in favor of union with Germany. An earlier plebiscite in Tyrol

resulted similarly, and another was to be held in Styria on July 3. The Austrian Government objected to these plebiscites as certain to have an unfortunate effect upon Austria's relations with neighboring states and with the Allied Powers. Without credit and strength, however, the central government at Vienna could do little to check the "Anschluss" movement. On June 1 the Mayr Cabinet resigned.

CONFERENCE AT PORTO ROSA.—Washington, June 7.—The Inter-Allied Conference for the consideration of ways and means of improving economic conditions in Central and Southern Europe will be held at Porto Rosa on June 15, this government was officially informed today.

This meeting, originally set for April 15, was postponed because of difficulty in agreeing upon a program. Great Britain, France and Italy will be officially represented at the meeting, and several smaller powers more directly interested will probably send spokesmen.

It has been definitely decided that the United States will be represented unofficially at the conference by Lieut. Col. Clarence B. Smith, former American representative on the Austrian section of the Reparations Commission.—*N. Y. Times,* July 6, 1921.

ITALY

GIOLITTI COALITION WINS ELECTION.—The parliamentary elections held in Italy on May 15 resulted in the choice of 226 members of the parties forming the coalition in support of Premier Giolitti. Of the total 535 members of the Italian parliament, the Socialists elected 134; Catholics, 102; Republicans, 8; followers of former premier Nitti, 15; Slavs, 6; and Germans, 4. The Slavs and Germans came from recently annexed territory. As a result of the elections the Socialists suffered a reduction from 170 to 134 seats. Numerous casualties were due to conflicts between Socialists and the patriotic organization of Fascisti.

NEAR EAST

BRITISH POLICY IN TURKEY.—London, June 9.—A conference of Ministers was held at Chequers today on the situation which has arisen in the Near East.

The new facts are, that since the failure of the last Greek offensive against Kemal two months ago, his government at Angora has assumed a truculent and uncompromising hostility towards Great Britain. The Kemalists have closed down some mines belonging to British subjects in Anatolia, on the ground that they belong to "belligerent" subjects, thus designating the British as belligerents. Kemal's Government, also, has prohibited British ships from touching at Turkish ports, and they have refused to stand by their own agreement signed in London relating to prisoners, having even seized some further British subjects and shot a British Indian. The Kemalist Extremists also have thrown over both Bekir and Sami and the agreement he made with the French, and they have just refused to receive M. Franklin-Bouillon, who wished to go to Angora as the French Agent.

Whether the Extremists at Angora have absorbed Mustapha Kemal or whether he is leading them as before may be in doubt, but what is not in doubt is that his government is receiving arms and munitions from Bolsheviki in Russia and that in sympathy with Bolshevist counsels they are defying the Western powers.

The Greeks are now contemplating a new offensive in Anatolia, the issue of which, says *The Chronicle's* diplomatic correspondent, may be pregnant with results affecting Europe.

The correspondent points out that if the Greeks were defeated and driven back to Constantinople, where there are British troops, would be in danger, and if the Kemalists gained Constantinople not only would they close the straits and so rob the Allies of one object for which the war in the East was waged, inflicting thus a deep wound on allied prestige in the Middle East, but they would without doubt proceed to attack Thrace and set the Balkans again in a blaze. It will be seen, therefore, how a situation may arise affecting closely British interests.

The British Government, although no fresh decision is called for at the moment, might, if the Kemalist hostility be persisted in, have to consider certain steps against the Kemalists. A blockade of Black Sea ports would cut off the supply of munitions to the Turks and the raising of the British embargo on the sale of arms and munitions would enable the Greeks to strengthen their forces. It may be anticipated, adds the correspondent, that no policy would be adopted which would involve this country in anything in the nature of a land campaign, but the pressure of events might necessitate Britain giving indirect assistance to the Greeks.

NEW GREEK OFFENSIVE AGAINST TURKS.—A new Greek offensive against the Turkish Nationalists was planned for the third week in June. The Turkish forces were estimated at about 100,000, against which the Greeks could launch 120,000 men, with superior equipment secured from Great Britain. King Constantine was to leave for the front on June 11.

FAR EAST

JAPANESE FOREIGN POLICY.—Tokio, June 2 (Associated Press).—The Hochi Shimbun says to-day that it has reason to believe that Japan has proposed to give the United States the Yap-Guam cable, with the privilege of control of the line to the Island of Yap. While Japan intends to keep the mandate, the newspaper says, she considers this to be virtual internationalization.

The Parliamentary Committee of the Kensei-kai, or opposition party, published a statement to-day that Viscount Uchida, the Foreign Minister, in receiving the members of the committee yesterday, said that Japan did not claim the exclusion of Manchuria and Mongolia from the Chinese consortium, but had insisted on assurance of protection of Japan's economic and general defense interests, to which the powers had consented. The committee asked what Japan would do if these claims were not granted. The Foreign Minister expressed confidence that the United States and Great Britain would observe the spirit of the agreement.

Asked if Japan should insist to the last on the Yap mandate and what was the government's policy, Viscount Uchida said:

"Of course, Japan will adhere to the mandate, but we are negotiating with Washington concerning the disposition of the Yap cables."

He further said that the time for the evacuation of Siberia had not arrived.

"Is Japan endeavoring to have China open negotiations for the restoration of Shantung by adopting a new policy?" the Foreign Minister was asked.

"No," he replied. "No negotiations have been opened by the two governments." *N. Y. Times*, March 6, 1921.

REDS IN VLADIVOSTOK OVERTHROWN.—At the close of May the Soviet authorities in Vladivostok were overthrown by anti-red forces, the remnants of Kolchak's army. The anti-red forces afterward advanced towards Chita, in East Baikal, the seat of the Far Eastern Republic.

It was stated by Japan that her troops in Vladivostok maintained a neutral attitude, but the Japanese commander at Vladivostok announced that,

in view of the situation developed, the Japanese would occupy various Siberian towns of strategic importance.

Following the fall of Vladivostok the Russian Foreign Minister, M. Tchitcherin, protested to the British and French Governments against the alleged unneutral policy of Japan in Siberia. On June 9, Earl Curzon replied for the British Government, pointing out that the charges were not supported by evidence, and refusing further correspondence on the subject.

UNITED STATES AND MEXICO.

TREATY PROPOSALS.—Mr. George T. Summerlin, American Chargé d'Affaires in Mexico, on May 29 presented a memorandum to President Obregon containing the outlines of a proposed political and commercial treaty between the United States and Mexico. To this memorandum President Obregon made a preliminary reply on June 6, and later expressed objection to certain parts of the proposed treaty, on the ground that they involved a violation of the Mexican constitution.

Secretary Hughes on June 7 issued a statement of the relations between the United States and Mexico, reading in part as follows:

"The fundamental question which confronts the Government of the United States in considering its relations with Mexico is the safeguarding of property rights against confiscation. Mexico is free to adopt any policy which she pleases with respect to her public lands, but she is not free to destroy without compensation valid titles which have been obtained by American citizens under Mexican laws. A confiscatory policy strikes not only at the interests of particular individuals, but at the foundations of international intercourse, for it is only on the basis of the security of property, validly possessed under the laws existing at the time of its acquisition, that commercial transactions between the peoples of two countries and the conduct of activities in helpful co-operation are possible.

"This question should not be confused with any matter of personalities or of the recognition of any particular Administration. Whenever Mexico is ready to give assurances that she will perform her fundamental obligation in the protection both of persons and of rights of property validly acquired, there will be no obstacles to the most advantageous relations between the two peoples.

"This question is vital because of the provisions inserted in the Mexican constitution promulgated in 1917. If these provisions are to be put into effect retroactively, the properties of American citizens will be confiscated on a great scale. This would constitute an international wrong of the gravest character and this government could not submit to its accomplishment. If it be said that this wrong is not intended, and that the constitution of Mexico of 1917 will not be construed to permit, or enforced so as to effect, confiscation, then it is important that this should be made clear by guarantees in proper form. The provisions of the constitution and the executive decrees which have been formulated with confiscatory purposes make it obviously necessary that the purposes of Mexico should be definitely set forth.

"Accordingly this government has proposed a treaty of amity and commerce with Mexico, in which Mexico will agree to safeguard the rights of property which attached before the constitution of 1917 was promulgated.

REVIEW OF BOOKS

"Arithmetic for Engineering." By Charles B. Clapham, Hons. B. Sc. Eng., London, Goldsmiths' College. pp. xi, 465. Price $4.00. (New York: E. P. Dutton & Co.)

"Mathematics for Engineers." By W. N. Rose, B. Sc. Eng., London, Goldsmiths' College. In two parts, pp. xiv, 510 and xiv, 419. Part I $6.00, Part II $7.00. (New York: E. P. Dutton & Co.)

These three books are meant to bridge the gap between two sorts of treatises: those that lean so far toward the practical as to give little or no scientific basis for the mathematical processes used by engineers, and those that are so academic as to be too difficult for any but college trained men either to comprehend or to apply to everyday problems.

Useful processes are introduced in many instances before it is advisable to present proofs of the principles upon which they depend, and are followed by explanations, more or less complete, after further progress has been made. Proofs likely to be found too intricate or too abstract are abbreviated or omitted, and typical concrete instances are used to show the general truth. Approximate methods are in some instances distinguished from those that are exact; in other instances such discrimination is lacking or incomplete. The choice in most of these cases seems wisely made.

Readers without technical training are likely to find as great difficulty with these books as readers without adequate schooling find with the ordinary academic texts. The problems are direct from practice, with little attempt to simplify their technicalities.

The Arithmetic for Engineers presents ordinary arithmetical processes, simple algebra, mensuration, logarithms, graphs and the use of the slide rule. Some of the presentation, especially in the case of simple equations, is remarkably full and tedious; the author seems unduly impressed either with the difficulty of the subject or with the simplicity of his readers. In parts much space is given to warnings against possible errors. These characteristics are much less prominent in the later volumes and are partly accounted for by the author's desire to make the book useful to those who must study without teachers.

Part I of the Mathematics for Engineers reviews and extends the presentation of algebra, and treats practical mensuration, the use of graphs and plane trigonometry. Part II is devoted to the calculus and its applications; the theoretical treatment here is fuller than the earlier parts of the series would lead one to expect. Graphical and mechanical methods of differentiation and integration are given full prominence, but analytical methods are not slighted. The problems in the second part give the reader insight into principles of physics, mechanics, strength of materials, hydromechanics, and ship-design. There are chapters devoted to mean values, differential equations, physical applications, harmonic analysis, probability and least squares. A chapter on polar coördinates is interpolated, and another on the solution of spherical triangles. The graphic solution given

for the spherical triangle is of little value; it does not compare at all favorably with the use of stereographic projections, which in a book of this nature might readily have been presented in brief form as the outcome of four or five principles.

The D. U. Series is full of interest and valuable information for a person trained in either school or shop; it could hardly be of great value to one trained in neither.

P. C.

"Drake, Nelson and Napoleon." By Sir Walter Runciman, Bart. Price $4.50. (G. P. Putnam & Sons.)

In this interesting work Sir Walter Runciman deals first with Drake and his Confreres—the great sailors of the Elizabethan Period—pirates according to present standards, but pure patriots according to those of the age in which they lived. They discovered new lands, opened up new avenues of commerce and fought the Spaniards wherever they could be found. In fact, Drake, the greatest seaman of that period, pursued the Spaniards into their own ports and captured their towns and ships on the Spanish Main where the prizes of war consisted of vast ransoms and rich plunder. Drake and the leaders of his time may be considered the seeds or roots from which sprang the modern British Sea Power with its fine traditions dating back to the seventeenth century.

Nelson may be considered the flower of the plant of which Drake was the seed. He has had no peer as a naval leader, but Sir Walter deals at length with Nelson as a man. In fact the major portion of the book treats of Nelson and his affair with Lady Hamilton. Sir Walter certainly calls black, black, and white—but no, there is no white to be found here.

It is amazing to read how this man—so great as a leader and still greater in the presence of the enemy—could be so mawkishly weak in his personal conduct. It makes one think of a strong and wise man made weak and foolish by too free use of liquor. And the corroding influence of his impure passion is shown to have affected finally Nelson's judgment.

As Nelson was undoubtedly the greatest stumbling block in the ambitions of Napoleon, Sir Walter treats of Napoleon in the last part of the book. Here is shown the errors of diplomacy committed by the weak English King and diplomats of the time. According to Sir Walter these English leaders failed to recognize the legitimacy of Napoleon's efforts, and instead of uniting with him as they should have done, they united with the rest of Europe to overthrow and send him to an exile's death. By so doing they made the grievous error of clearing the field for Prussia which later combined, as clearly foretold by Napoleon, with the minor German States to form the German Empire. These errors of Englishmen were the seeds of the Great War with its overwhelming losses of blood and treasure.

Thus Sir Walter shows that the Great War was not the result of the act of an assassin but that the causes date back more than a century.

This is a most interesting book. One does not often read such frank opinions of men and their acts as Sir Walter expresses. It is most refreshing.

T. L. J.

"The Machinist's Blue Book." E. R. Glass, Editor. Price $4.00. (By International Association of Machinists Publishing Co., 25 West Street, New York.)

This book is a compilation of different mechanical subjects, and its nature is more nearly that of an aid to the worker than a text book for the student. It is essentially practical, describing not merely what to do, but *how* to do it and should be invaluable to the engineer, shop manager, or repair officer.

The contents are somewhat loosely arranged, consisting apparently of contributions from a large number of practical machinists.

The following is a general outline of the subjects handled: Properties of metals, alloys, etc. Influence of different elements on steel. Tempering, hardening, and testing of metals. Measuring instruments, verniers, micrometers, gauges, of all kind. A discussion of the slide valve, with the Stephenson link and Walschaerts gear for locomotives, and very complete instructions for valve-setting.

Bearings, their lubrication, and adjustment, re-lining and fitting. A treatise on all the common machine tools, lathes, drills, boring machines, planers, shapers, slotting, and milling machines. This part of the work goes deeply into the mechanism of the machines themselves, with their accessories, tools, methods of testing, centering, adjustment, face plate and chuck work, tapering, reaming, drilling, boring and screw cutting; the forging, tempering and grinding of tools; cutting angles, cutting speeds, etc. Similar matter for all the different machine tools with special instructions for the design and cutting of gear teeth.

Blue prints and mechanical drawings, and how to read them. Forge work, with welding, tempering, and hardening. Bench work, hammering, filing, chipping, broaching, tap-and-die threading.

Grinding machines, with the forging, hardening, and tempering of all kinds of drills and cutters. Formulae for the design of gears and gear teeth.

Pipes and pipe-fitting, flanges, couplings, gaskets, expansion-joints, with soldering, brazing, lead-wiping and other methods of joining. The grinding and re-seating of valves.

Mill-wright work, including engine foundations and the lining up of engines, shafting, etc. Special kinks and information of a useful nature for shop work.

Questions and answers in gas engines, turbines, condensate pumps, air ejectors, condensers, reduction gears and electricity. Spontaneous combustion, analysis of coal, chemical tests of water and a dictionary of terms used in shipbuilding.

Questions and answers on shop work.

About one-fifth of the whole book is devoted to welding by the oxy-acetylene process. This is most complete, covering the general theory, properties of metals to be handled, preparation, pre-heating, numerous examples of the method to be used in different cases, and a description of the plant for generating the gases required.

A large number of useful tables are included in the body of the work, comprising the following:

Tensile strength of materials, equivalents of millimeters in decimals of an inch, of fractions of an inch in millimeters, demical equivalents of parts of an inch, decimal equivalents of Stubs' steel wire gauge, and of twist drills and steel wire gauge by number.

U. S. Standard Gauge for sheets and plates, giving No. of gauge, thickness in fractions of an inch and in decimals, and weight per square foot in ounces and pounds. Comparative table of various standard gauges. Thickness and weights of iron and steel sheets by Birmingham Wire Gauge and Brown and Sharpe.

Table of sharp V-threaded screws, of thread parts for Acme Standard or 29° thread, of Morse tapers for shanks and sockets, of lathe cutting speeds for different materials, of Footstock Setovers for Morse and Brown and Sharpe tapers.

Table of lathe cutting speeds in feet per minute for various diameters of work and speed of revolution, of lubricants for cutting various materials, of decimal equivalents of normal sizes of drills for tapping.

Thread tables for Whitworth Standard, British Standard Fine, and Acme Standard. Tables for tap drills, giving size of tap, number of threads, and size of drill hole. Tables of tooth parts for gearing in terms of diametral and circular pitch, thickness of tooth, etc.

Table of dimensions and weights of pipe fittings, etc. Tables of allowances and limits for sliding, driving, and shrinkage fits. Tables of ordinary weights and measures, of areas and circumferences of circles, and of squares, cubes, square and cube roots.

The foregoing sounds like dry reading, but as a matter of fact the book will be found of interest, not only to the machinist, but to anyone of general technical knowledge.

R. C. P.

"The Elements of Fuel Oil and Steam Engineering." By Sibley and Delany. Price $5.00 (McGraw-Hill Book Company, Inc., 1921.)

The book is divided into three main subdivisions, the first including a general description of the modern power plant equipped with oil burning boilers and giving an exposition of the elementary laws of steam engineering; the second dealing with the efficient utilization of fuel oil in a modern power plant, and the third covering the testing of oil fired boilers and giving suggestions for conducting boiler tests and taking, recording and tabulating the data.

The description of the modern power plant is too general to be of value to any save those entirely lacking in knowledge of the subject. The presentation of the elementary laws of steam engineering is too disconnected to be of use to a beginner in this subject and not complete enough for an advanced student.

The subject of safe operation of steam boilers, the efficient operation of oil fired boilers, and furnaces in fuel oil practice is well handled.

Generally the illustrations are of little value. Many are not clear, few are described and a large number are photographs of no value to the student.

The third subdivision on testing oil fired boilers is excellent and contains many valuable suggestions.

J. O. R.

"Introduction to the Study of Submarine Warfare." By Commander A. Laurens. (Published by Augustin Challamel, Paris, France.)

In his preface to the book, Commander Laurens explaining the title states it as a brief and rather dry collection of facts concerning the action of submarines during the World War.

This most valuable collection of data, while rather dry reading, furnishes an excellent historical record to be used as a basis for study of the possibilities of submarine development in the future.

Commander Laurens takes up in chronological order the economic results brought about by submarine warfare and the political action of the various powers, allied and neutral, which were taken as the result of these economic conditions. The actual campaign of the submarines is detailed, and the offensive and defensive measures taken by the Allies to meet the enemy submarine warfare.

Commander Laurens was fortunate in being on duty at the Ministry of Marine during the greater part of the war, and was personally interested in compiling, month by month, the many valuable charts and tables in the appendix of the book. One of these tables gives the cruise of each submarine and the numbers and types of vessels sunk on each cruise. Another interesting table shows, by curves, the rise in the destruction of tonnage until April 1917, and the gradual fall until August 1918, when it became evident that the submarine warfare was a failure. Another table gives the life of each submarine. It shows how short was the life of most of the boats. A study of this table makes clear the mode of destruction; but this mode of destruction was unknown to the Germans themselves, they only knew that the boats did not return.

The British, early in the war, urged that nothing should be given out concerning this destruction of the submarines, arguing that if the Germans did not know how the boats were lost they would have great difficulty in avoiding further loss from the same cause. They further argued that the mysterious disappearance of boat after boat would eventually have a tremendous psychological effect upon the officers and men who still survived, and that they would evince greater and greater reluctance to go out to an unknown fate until finally they would be driven to mutiny. As is well known the German Navy did finally mutiny, and, no doubt this policy had much to do with the mutiny.

As a compilation of the official facts of submarine warfare this book is particularly valuable.

R. H. J.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

H. K. HEWITT,
Commander, U. S. N., Secretary and Treasurer.